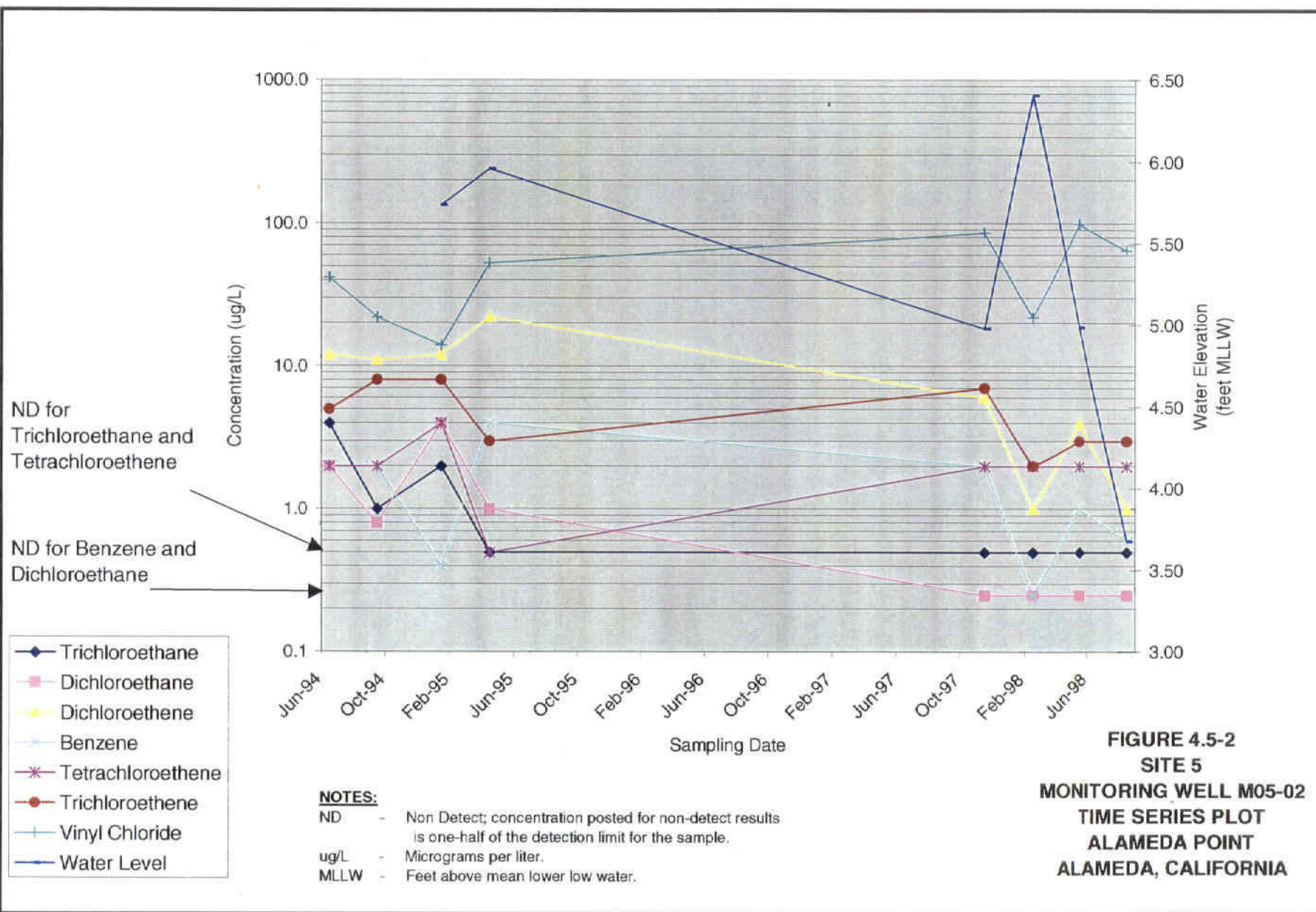
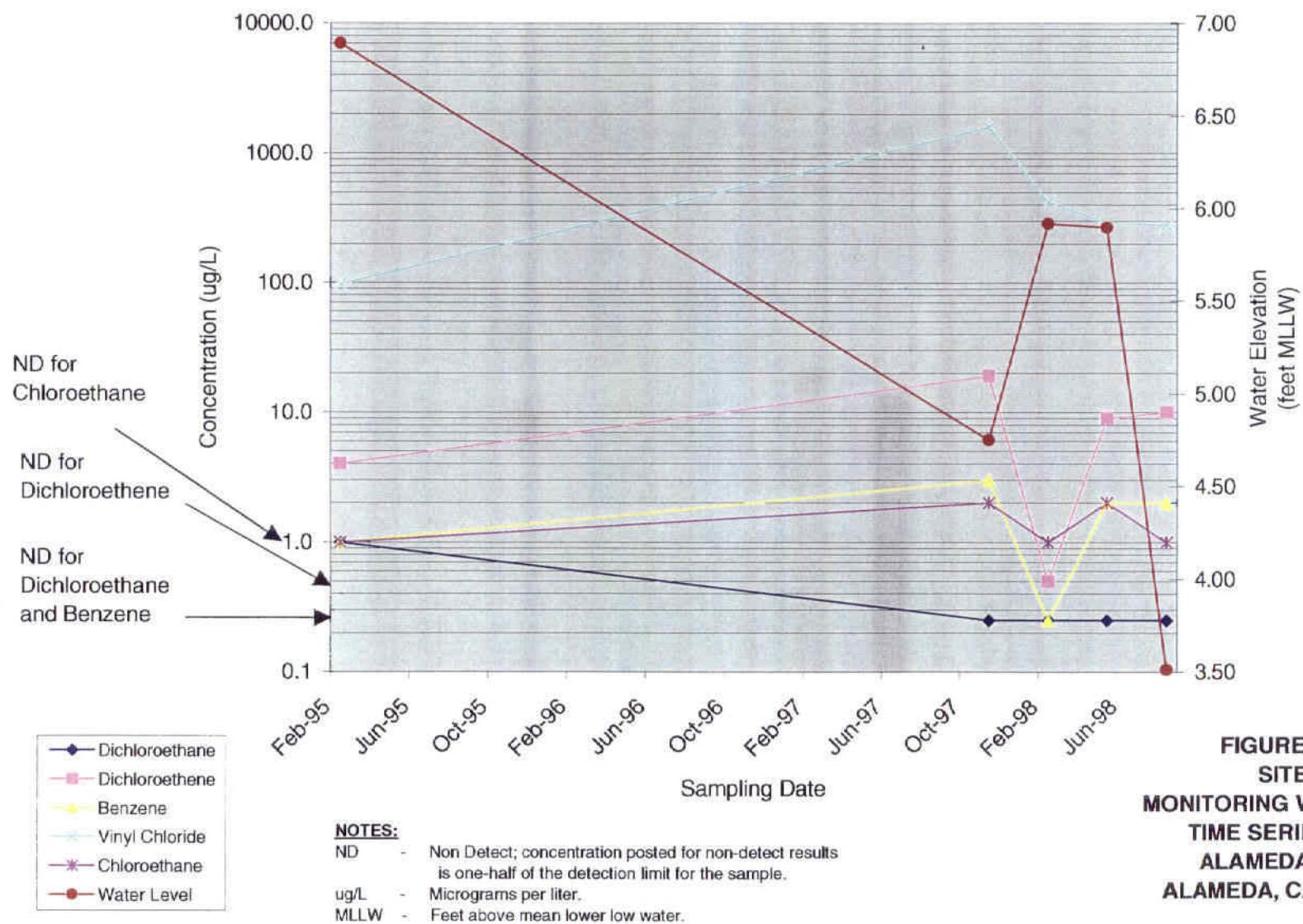


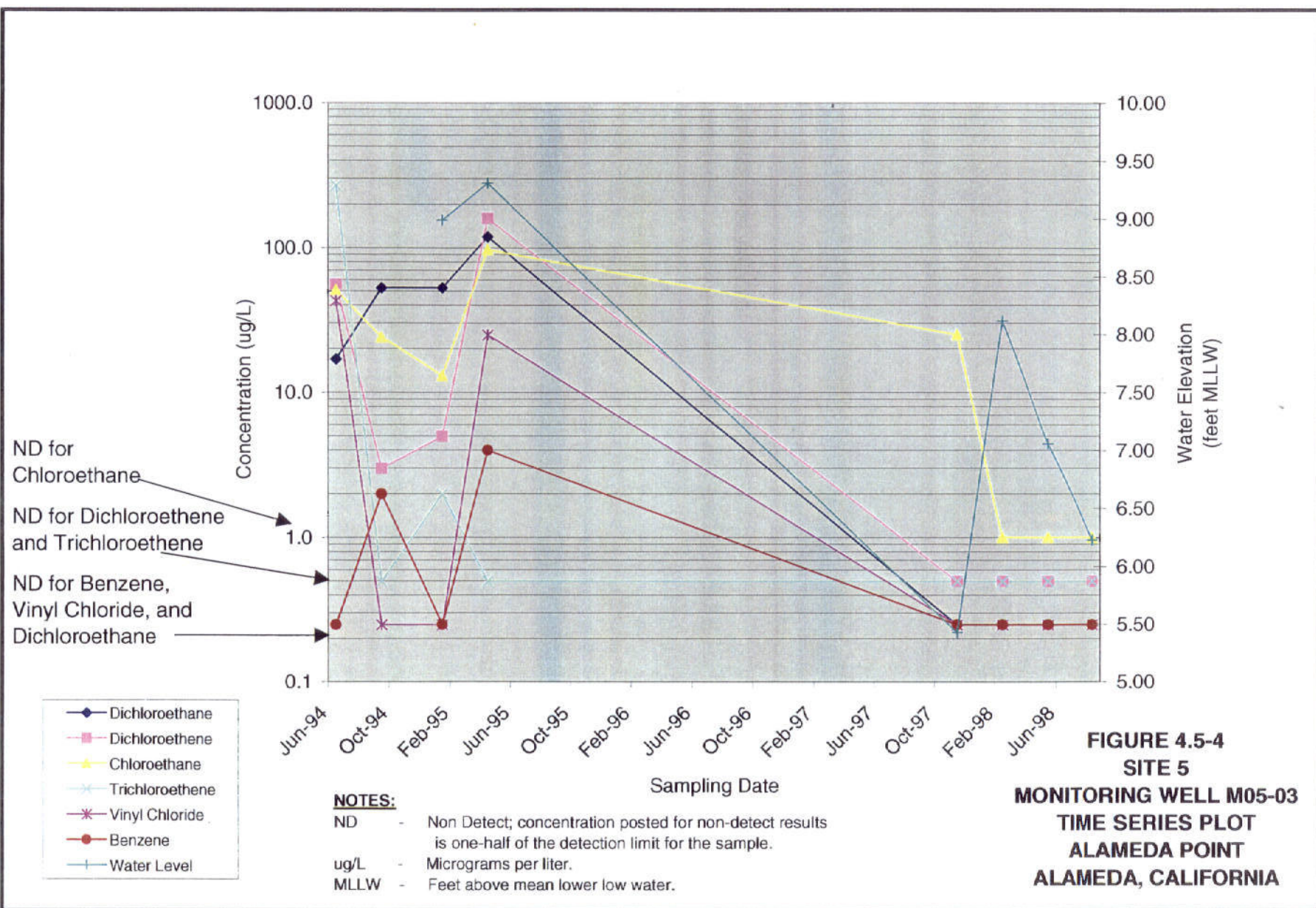
**FIGURE 4.5-1**  
**SITE 5**  
**MONITORING WELL M05-06**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



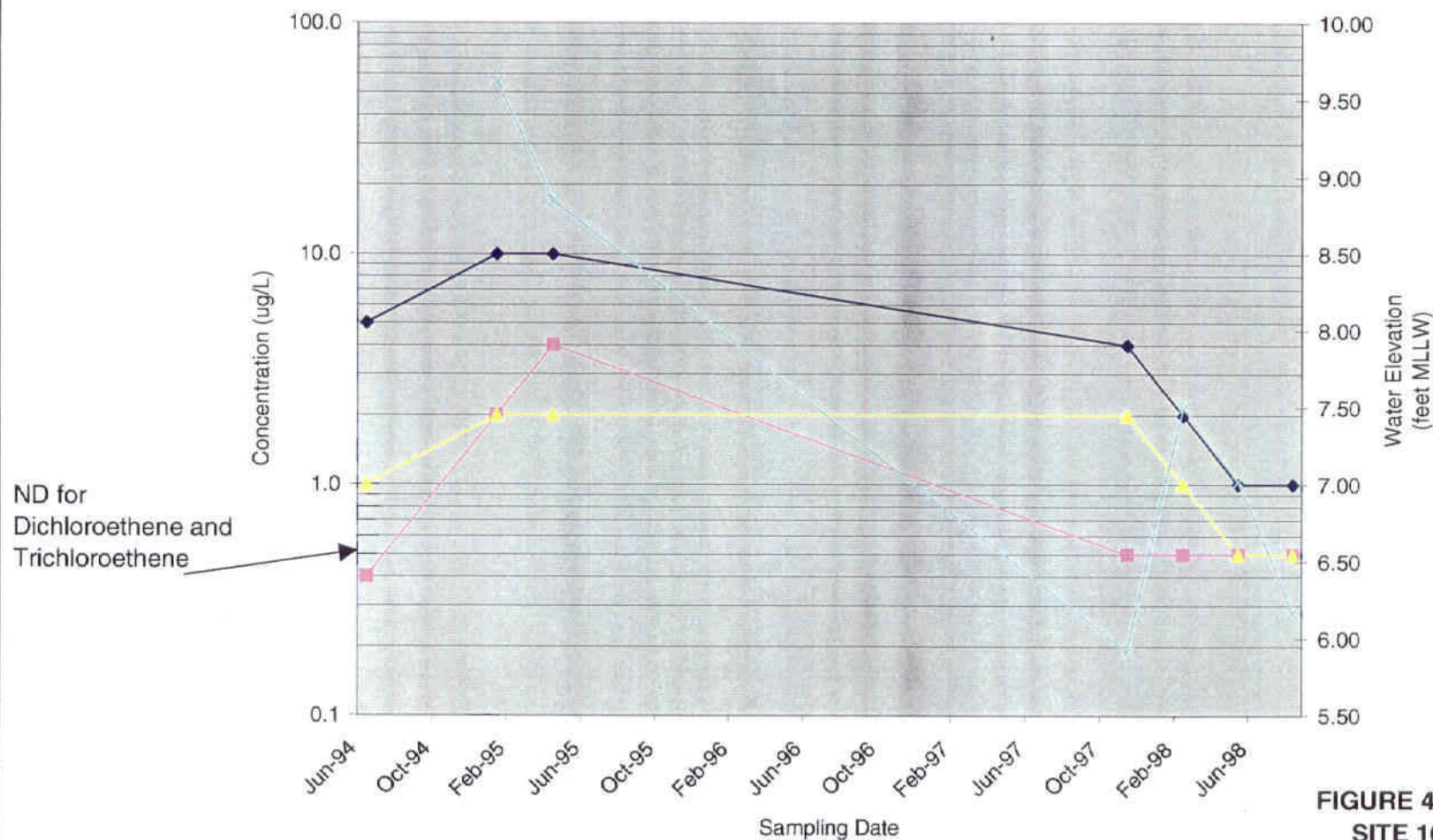




**FIGURE 4.5-3**  
**SITE 5**  
**MONITORING WELL M05-11**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



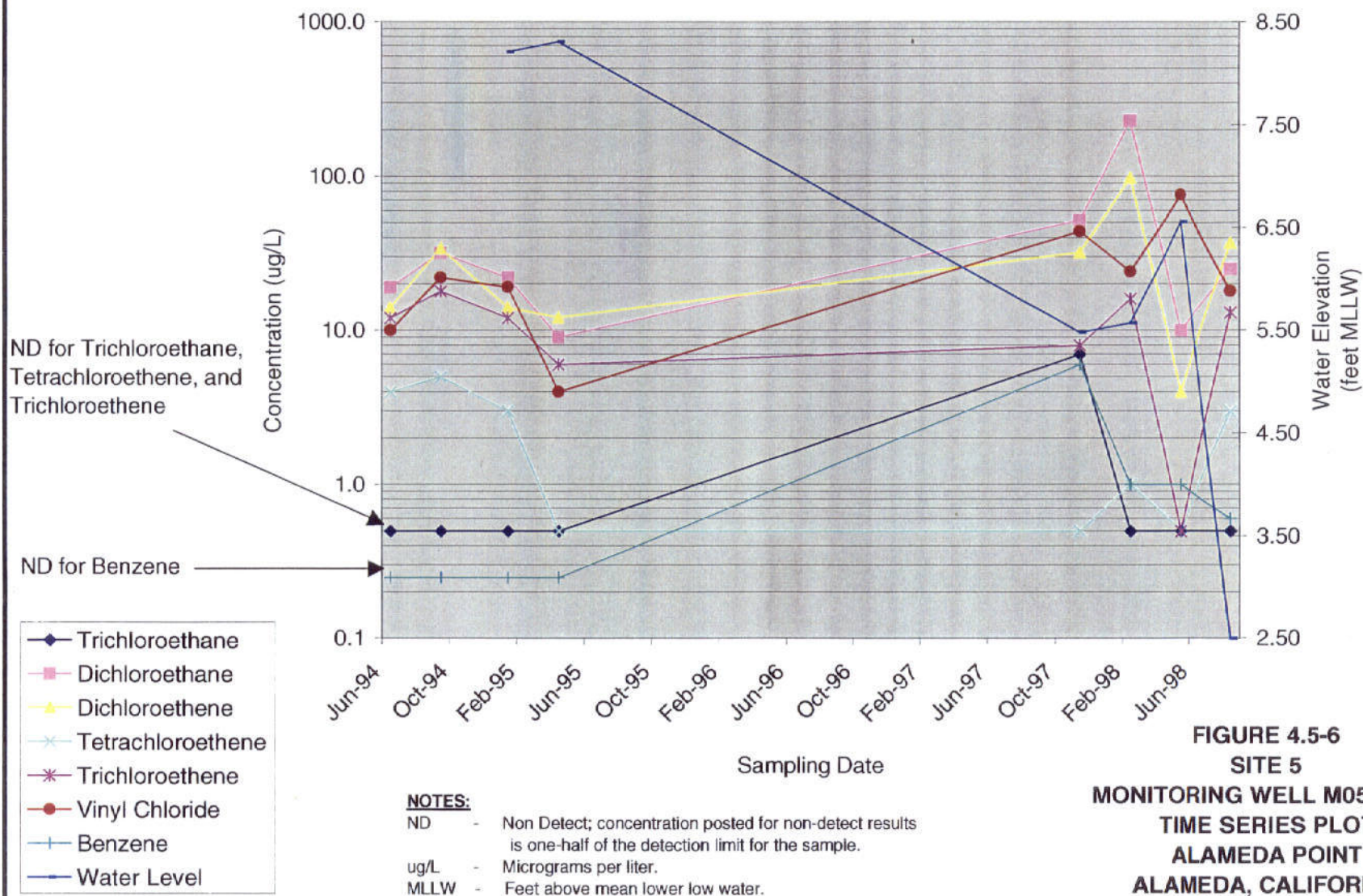




**FIGURE 4.5-5**  
**SITE 10**  
**MONITORING WELL M10-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

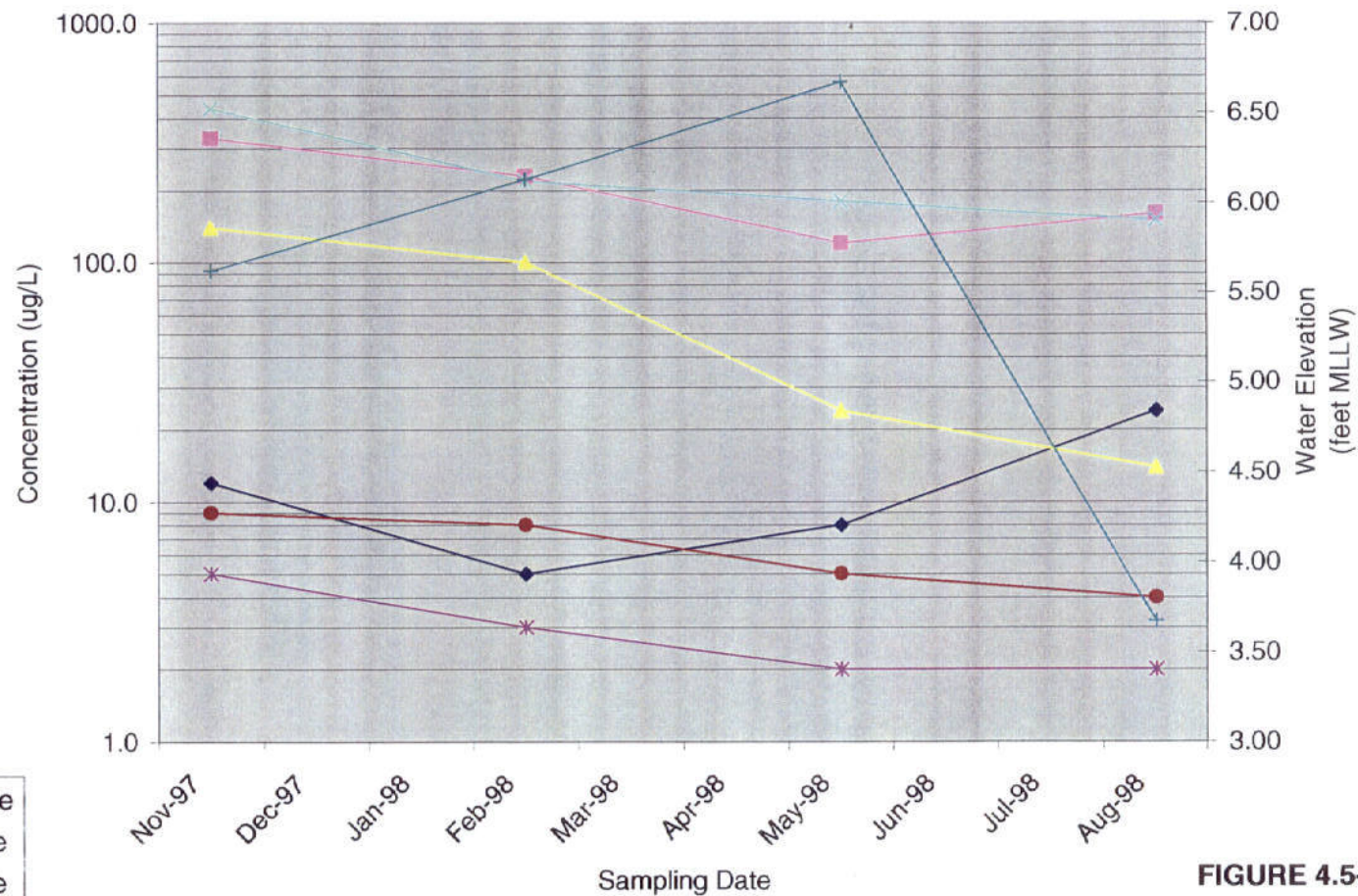
**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.



**FIGURE 4.5-6**  
**SITE 5**  
**MONITORING WELL M05HW-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



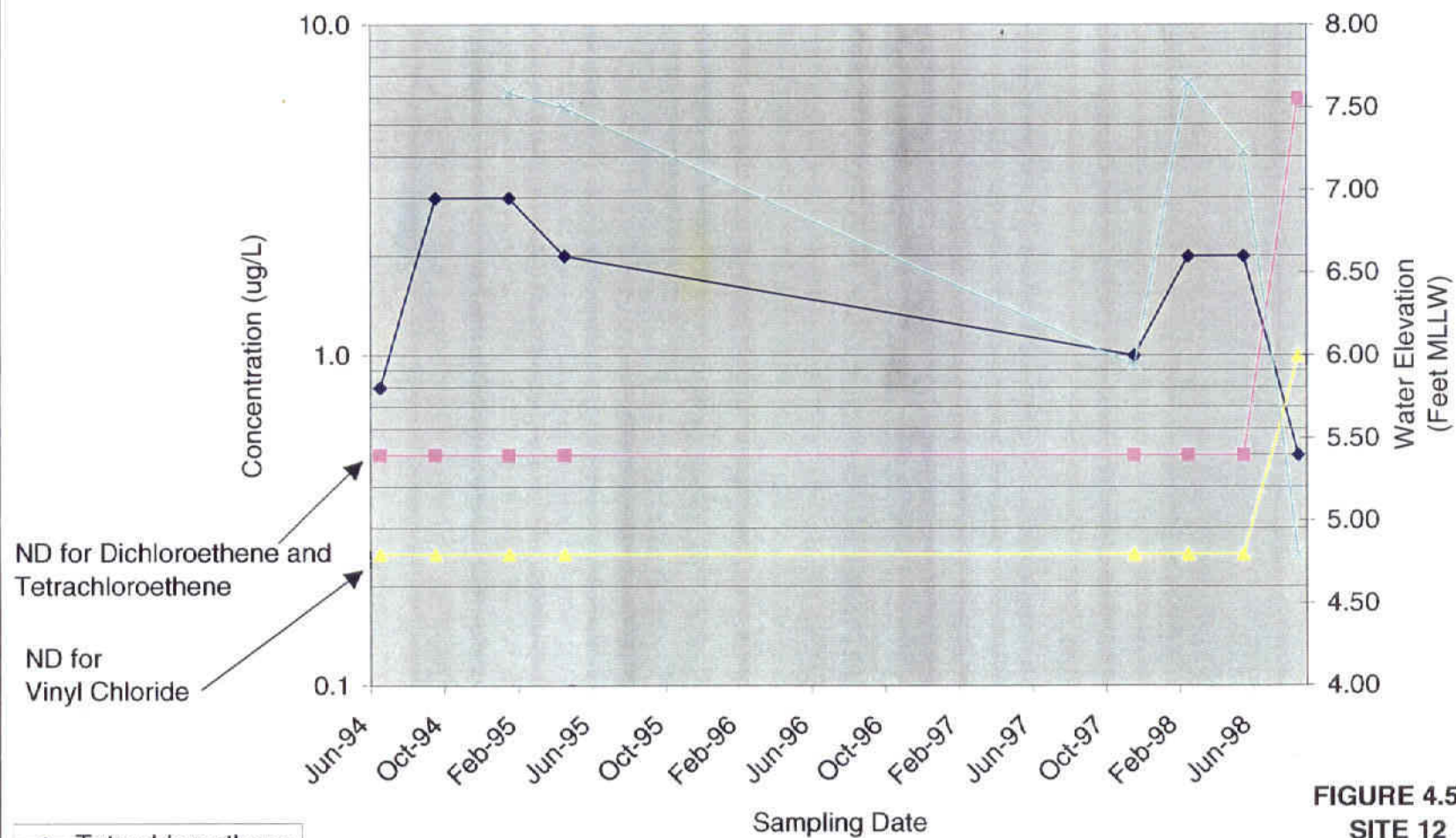


- ◆ Trichloroethane
- Dichloroethane
- ▲ Dichloroethene
- ✦ Chloroethane
- \* Trichloroethene
- Vinyl Chloride
- + Water Level

**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.5-7**  
**SITE 5**  
**MONITORING WELL M05-10**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

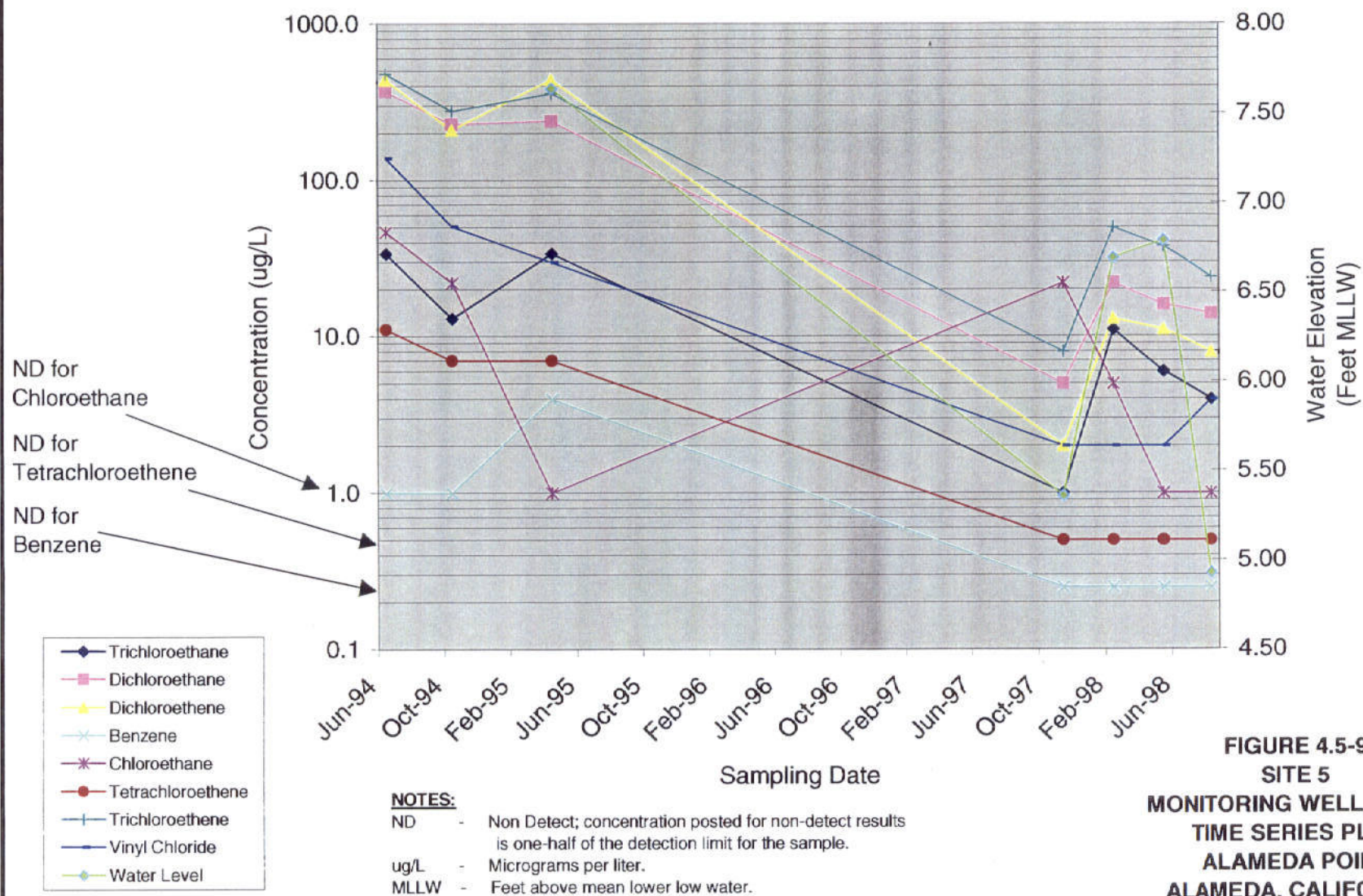


**FIGURE 4.5-8**  
**SITE 12**  
**MONITORING WELL M12-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

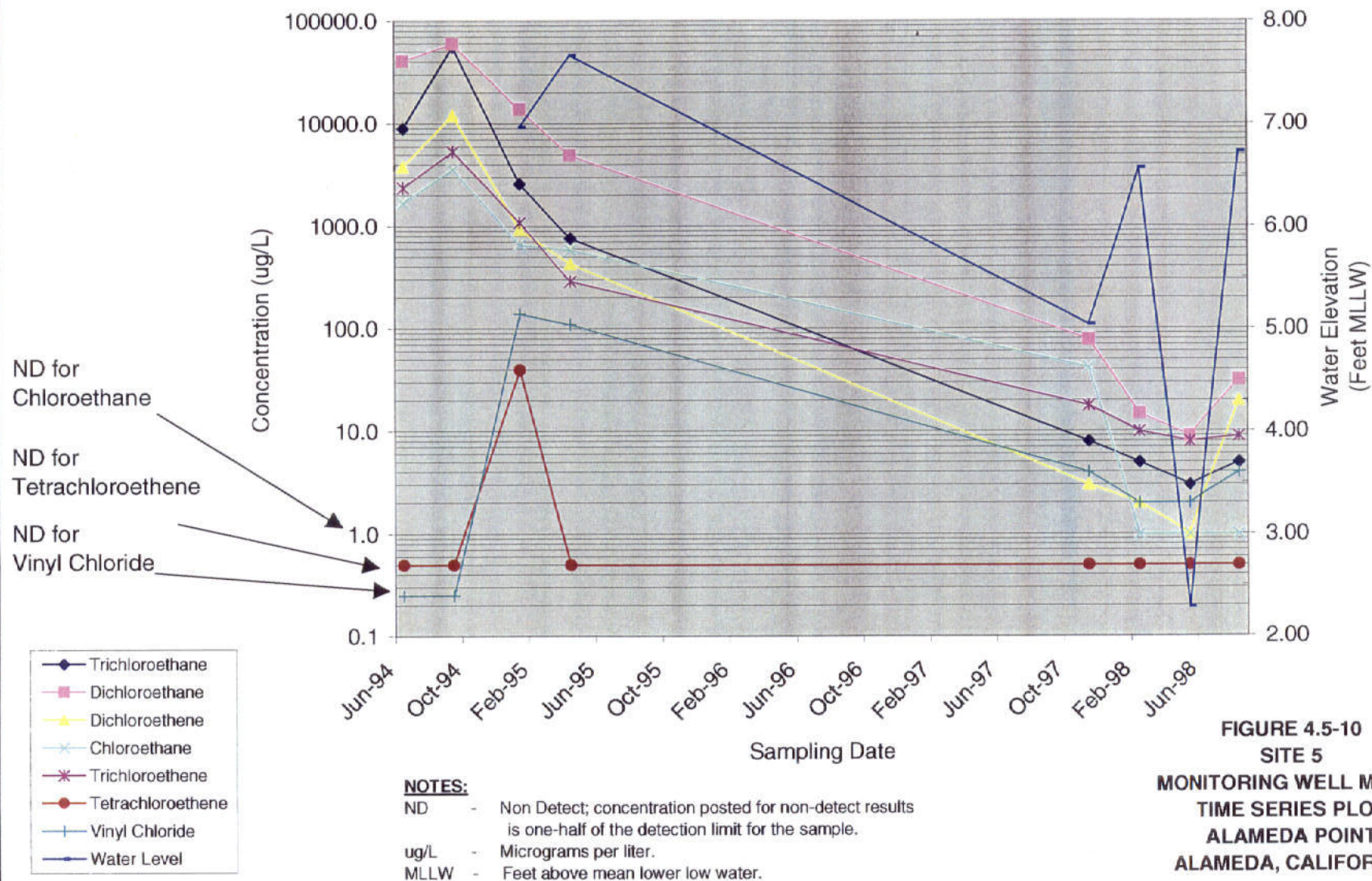
**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.



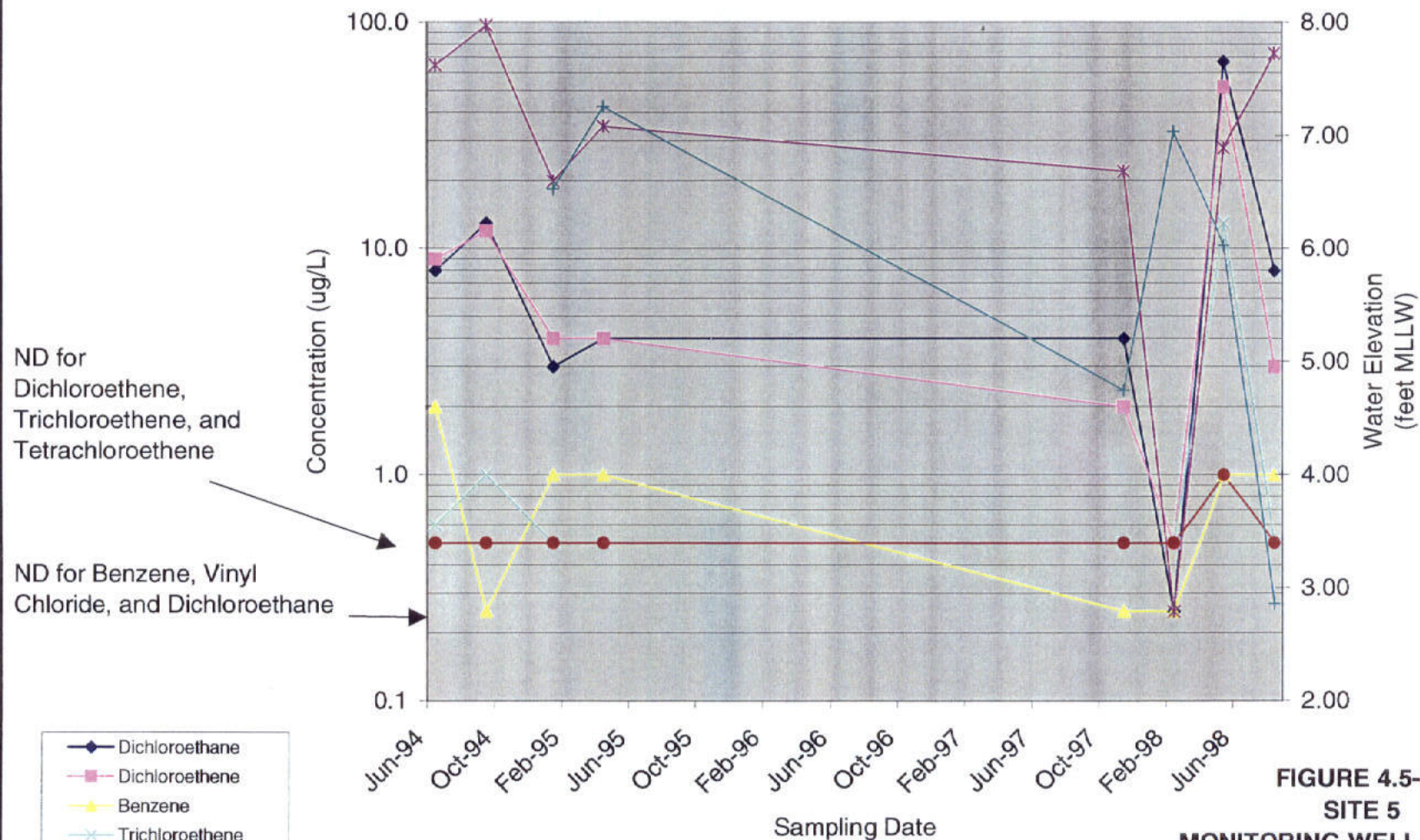


**FIGURE 4.5-9**  
**SITE 5**  
**MONITORING WELL M05-04**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



**FIGURE 4.5-10**  
**SITE 5**  
**MONITORING WELL M05-07**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

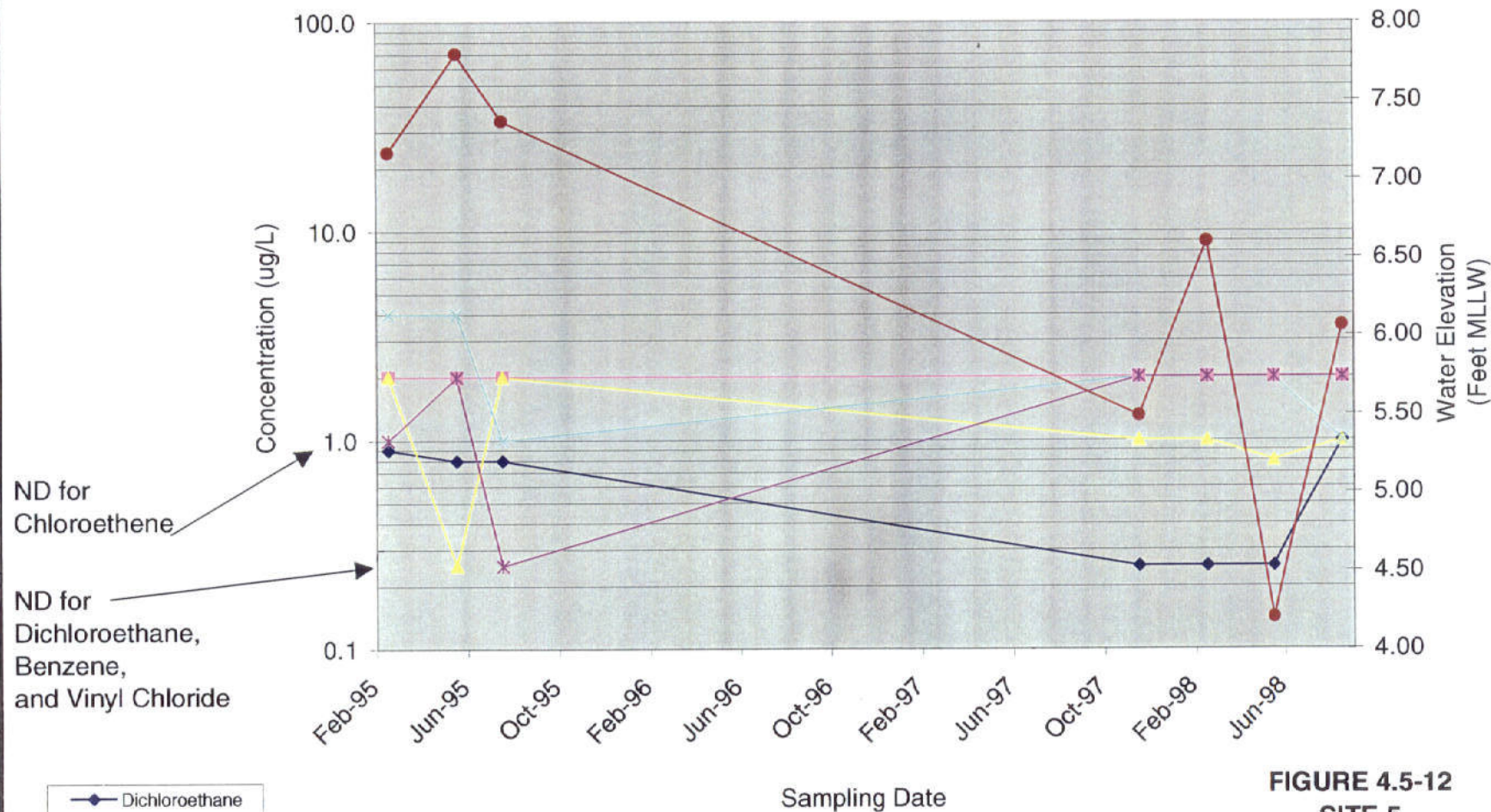




**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.5-11**  
**SITE 5**  
**MONITORING WELL M05BS-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

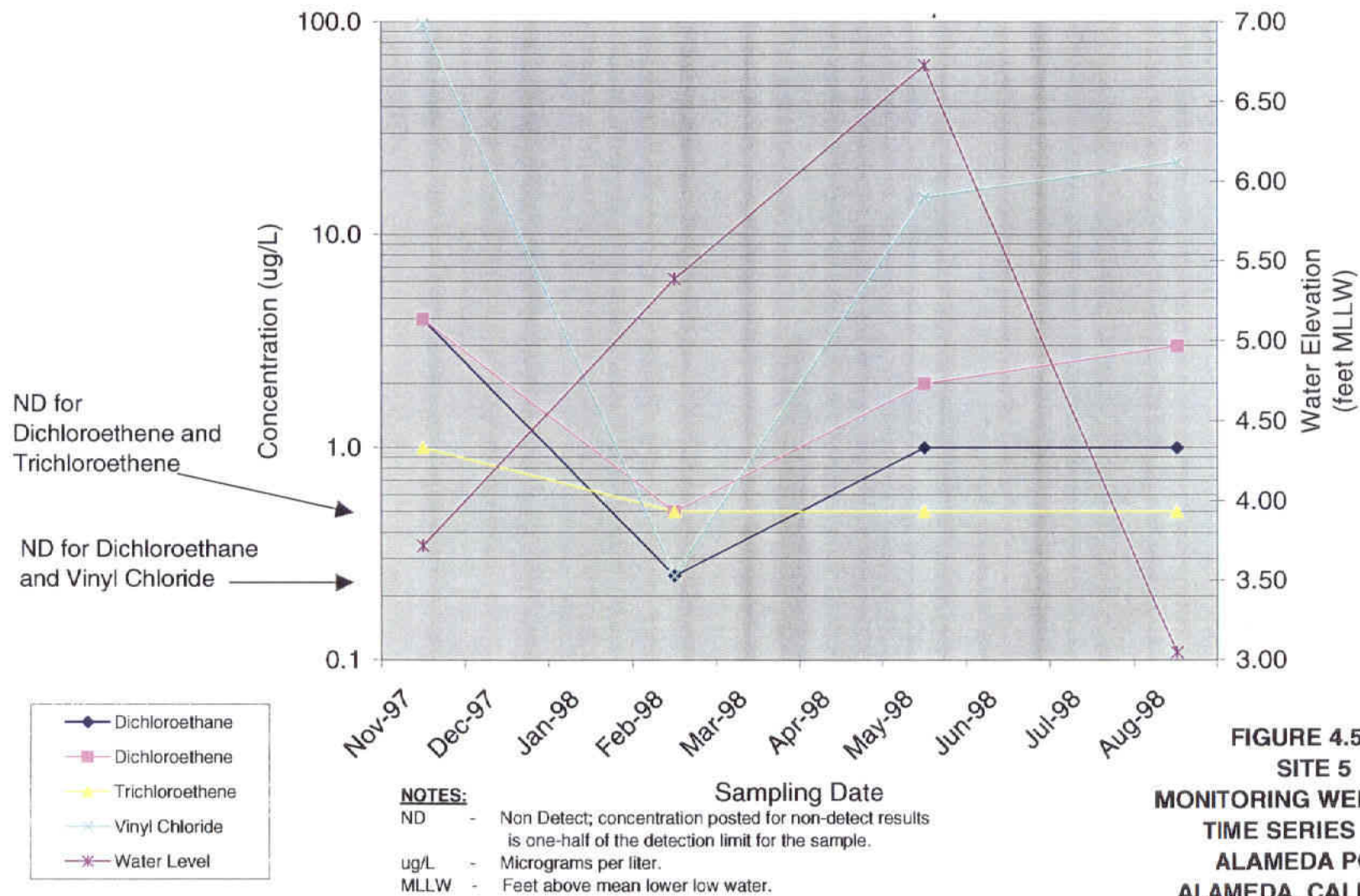


**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.5-12**  
**SITE 5**  
**MONITORING WELL M05-12**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**





**FIGURE 4.5-13**  
**SITE 5**  
**MONITORING WELL M05-05**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

#### 4.6

#### **SITE 6 – BUILDING 41, AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY**

Site 6 is located near the northeast corner of the Seaplane Lagoon (Figure 1.2-2). The site consists of Building 41, a former aircraft repair facility. Various halogenated and nonhalogenated solvents, paints, strippers, hydraulic fluids, and their associated wastes were used and/or stored in the building. An above-ground solvent tank was present west of the building (PRC and Montgomery Watson 1993c).

Currently, there are six active groundwater monitoring wells at Site 6; only one well was selected for quarterly sampling. During prior sampling of these wells, VOCs associated with past operations at Building 41 were detected in groundwater samples.

For each quarter, Table 4.0-1 lists the groundwater well that was sampled at Site 6 and identifies the parameters for which the quarterly samples were analyzed. The location of this well is shown on Figure 1.2-3.

##### **4.6.1 Sampling Plan Rationale**

Well M06-06 is screened in the FWBZ. This well is located adjacent to Building 41, in the central portion of the solvent plume located west of the building. Samples from this well were analyzed for VOCs. The VOC data were collected to monitor solvent concentrations within the plume.

Samples from well M06-06 were also analyzed for metals and general water quality parameters. Data from these analyses were collected for a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from this well were analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents found at Site 6; a high TOC concentration indicates a high biodegradation potential. Sections 4.6.2 through 4.6.5 present the analytical results for each quarter of sampling.



#### 4.6.2 Quarter 1 Analytical Results

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from well M06-06, screened in the FWBZ, during Quarter 1. This well is shown on Figure 4.1-1, Sheet 1, along with all FWBZ wells with detected organic compounds exceeding the MCLs. Inorganic constituents also exceeded the MCLs in this well during Quarter 1, as shown on Figure 4.1-3, Sheet 1.

Organic compounds detected in well M06-06 are presented in Table 4.6-1. These compounds include 1,1-DCA, 1,1-DCE, cis-1,2-DCE, PCE, trans-1,2-DCE, and TCE. In general, VOC concentrations were low relative to other sites. A concentration of 30  $\mu\text{g/L}$  of cis-1,2-DCE was the maximum detected concentration of VOCs at Site 6. Groundwater flow in the vicinity of Site 6 is toward the southeast (Figure 1.2-2).

Table 4.6-2 presents the inorganic constituents detected in groundwater at Site 6. The metals detected in well M06-06 during Quarter 1 sampling were barium, manganese, molybdenum, and nickel.

Well M06-06 was analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. This well was also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.6-3.

#### 4.6.3 Quarter 2 Analytical Results

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from the Site 6 well M06-06, screened in the FWBZ, during Quarter 2. This well is shown on Figure 4.1-1, Sheet 2. Inorganic constituents were not detected at concentrations exceeding the MCLs in this well during Quarter 2 sampling.

The organic compound detected in well M06-06 is presented in Table 4.6-1. Vinyl chloride (at a concentration of 2  $\mu\text{g/L}$ ) was the only VOC detected during Quarter 2 sampling in the Site 6 well. Groundwater flow in the vicinity of Site 6 is toward the southeast (Figure 1.2-2).

Table 4.6-2 presents the inorganic constituents detected in groundwater at Site 6 during Quarter 2. The metals detected in well M06-06 were barium, cadmium, molybdenum, and zinc.

Well M06-06 was analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.6-3.

#### **4.6.4 Quarter 3 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from the Site 6 well M06-06, screened in the FWBZ, during Quarter 3, as shown on Figure 4.1-1, Sheet 3. Inorganic constituents were also detected during Quarter 3 sampling at concentrations exceeding the MCLs in this well, as shown on Figure 4.1-3, Sheet 3.

The organic compounds detected in well M06-06 during Quarter 3 are presented in Table 4.6-1.

1,1-DCA, 1,1-DCE, cis-1,2-DCE, PCE, trans-1,2-DCE, and TCE were detected at concentrations ranging from 2 µg/L to 36 µg/L in the Site 6 well. Groundwater flow in the vicinity of Site 6 is toward the southeast (Figure 1.2-2).

Table 4.6-2 presents the inorganic constituents detected in groundwater at Site 6 during Quarter 3. The metals detected in well M06-06 were arsenic, barium, chromium, manganese, molybdenum, nickel, and zinc.

Well M06-06 was analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.6-3.

#### **4.6.5 Quarter 4 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from the Site 6 FWBZ well M06-06, during Quarter 4, as shown on Figure 4.1-1, Sheet 4. Inorganic constituents were also detected during Quarter 4 sampling at concentrations exceeding the MCLs in this well, as shown on Figure 4.1-3, Sheet 4.

The organic compounds detected in well M06-06 during Quarter 4 are presented in Table 4.6-1. The VOCs 1,1-DCE, cis-1,2-DCE, PCE, and TCE were detected at concentrations ranging from 1 µg/L to 10 µg/L in the Site 6 well. Groundwater flow in the vicinity of Site 6 is toward the southeast (Figure 1.2-2).



Table 4.6-2 presents the inorganic constituents detected in groundwater at Site 6 during Quarter 4. The metals detected in well M06-06 were barium, cobalt, lead, manganese, and molybdenum.

Well M06-06 was analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.6-3.

#### **4.6.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Site 6, changes in chemical type and concentration were followed over a period from 1994 through 1998. A time-series plot (Figure 4.6-1) was prepared for one monitoring well (M06-06) at Site 6, located within a chlorinated solvent contaminant plume depicted in Figures 6-3 and 6-4. The time-series plot presents a more diverse group of chemicals than the three representative chemicals shown in the contaminant plumes in Figures 6-3 and 6-4.

Chlorinated solvent concentrations within monitoring well M06-06 have generally decreased over the four year time frame. A slight reduction in the concentrations of the parent compounds (PCE and TCE) and an a more substantial decrease in the concentrations of the degradation products (DCE, DCA, and vinyl chloride) has occurred. The range of concentrations for most of the chemicals has changed dramatically over the last year, decreasing to near chemical reporting limits in the spring of 1998. However, in the summer of 1998, the concentrations of PCE, TCE, DCE, and DCA increased 1 to 2 orders of magnitude in response to a relatively large change in groundwater elevation. The change in groundwater elevation does not correlate with a major precipitation event. This behavior is similar to the situation where residual solvent is flushed from the overlying soil or capillary fringe in response to infiltrating rainwater. The relatively low concentration of degradation endpoint products (vinyl chloride) would also suggest that the plume is fairly young.

TABLE 4.6-1  
SITE 6  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M06-06	108-S06-001	11/04/97	1,1-DICHLOROETHANE: 9 1,1-DICHLOROETHENE: 12 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 30J TETRACHLOROETHENE: 7 TRANS-1,2-DICHLOROETHENE: 2 TRICHLOROETHENE: 8	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected



TABLE 4.6-1  
SITE 6  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M06-06	108-S06-002	02/06/98	2-BUTANONE: R ACETONE: R VINYL CHLORIDE: 2	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.6-1  
SITE 6  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M06-06	106-S06-003	05/12/98	1,1-DICHLOROETHANE: 6 1,1-DICHLOROETHENE: 7 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 36 TETRACHLOROETHENE: 4 TRANS-1,2-DICHLOROETHENE: 2 TRICHLOROETHENE: 6	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected



TABLE 4.6-1  
SITE 6  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M06-06	108-S06-004	08/06/98	1,1-DICHLOROETHENE: 1J 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 10J TETRACHLOROETHENE: 8J TRICHLOROETHENE: 6J	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.6-2  
SITE 6  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
M06-06	108-S06-001	11/04/97	<0.93	<4.5	90.6J	<0.15	<0.30	<0.30	<0.40	<0.65	<0.65	137	<0.10	3.6J	3.4J	<1.0	<0.35	<1.2	<1.8	<9.9

Notes:  
 $\mu\text{g/L}$  = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit

TABLE 4.6-2  
SITE 6  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SILICON	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
M06-06	108-S06-002	02/06/98	<0.84	<0.80	13.8J	<0.10	0.90J	<1.5	<0.25	<1.6	<0.70	<6.9	<0.10	1.2J	<0.90	<0.80	<0.15	<1.4	<2.1	13.0

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 •

< = Parameter reported below reporting limit



TABLE 4.6-2  
SITE 6  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
M06-06	108-S06-003	05/12/98	<0.85	2.1J	349	<0.10	<0.15	1.7J	<0.30	<2.7	<1.0	60.3	<0.10	3.1J	2.9J	<0.85	<0.30	<1.4	<3.2	93.1

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.6-2  
SITE 6  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I O M	Z I N C
			(µg/L)																	
M06-06	108-S06-004	08/06/98	<1.8	<3.3	70.9J	<0.20	<0.30	<0.80	1.7J	<0.89	17.5	70.9	<0.10	3.4J	<1.9	<2.2	<0.70	<1.4	<0.82	<8.8

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.6-3  
SITE 6  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M06-06	108-S06-001	11/04/97	Alkalinity: 343 Bicarbonate: 343	Bromide: 2.2 Chloride: 489 Phosphate: 0.73 Sulfate: 33.4	Total Dissolved Solids: 600	ND	Total Organic Carbon: 3

Notes:

mg/L = Milligrams per liter

ND = Not detected



TABLE 4.6-3  
SITE 6  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
M06-06	108-S06-002	02/06/98	Alkalinity: 32 Bicarbonate: 32	Chloride: 9.2 Fluoride: 0.2 Nitrate: 0.17 Sulfate: 5.8	Total Dissolved Solids: 140

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration

TABLE 4.6-3  
SITE 6  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M06-06	108-S06-003	05/12/98	Alkalinity: 229 Bicarbonate: 229	Bromide: R Chloride: 242 Nitrate-N: 0.16 Phosphate: 0.35 J Sulfate: 26.3	Total Dissolved Solids: 960	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected  
R = Rejected

TABLE 4.6-3  
SITE 6  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M06-06	108-S06-004	08/06/98	Alkalinity: 286 Bicarbonate: 292	Bromide: 0.7 Chloride: 105 Sulfate: 34.6	Total Dissolved Solids: 600	ND	NA

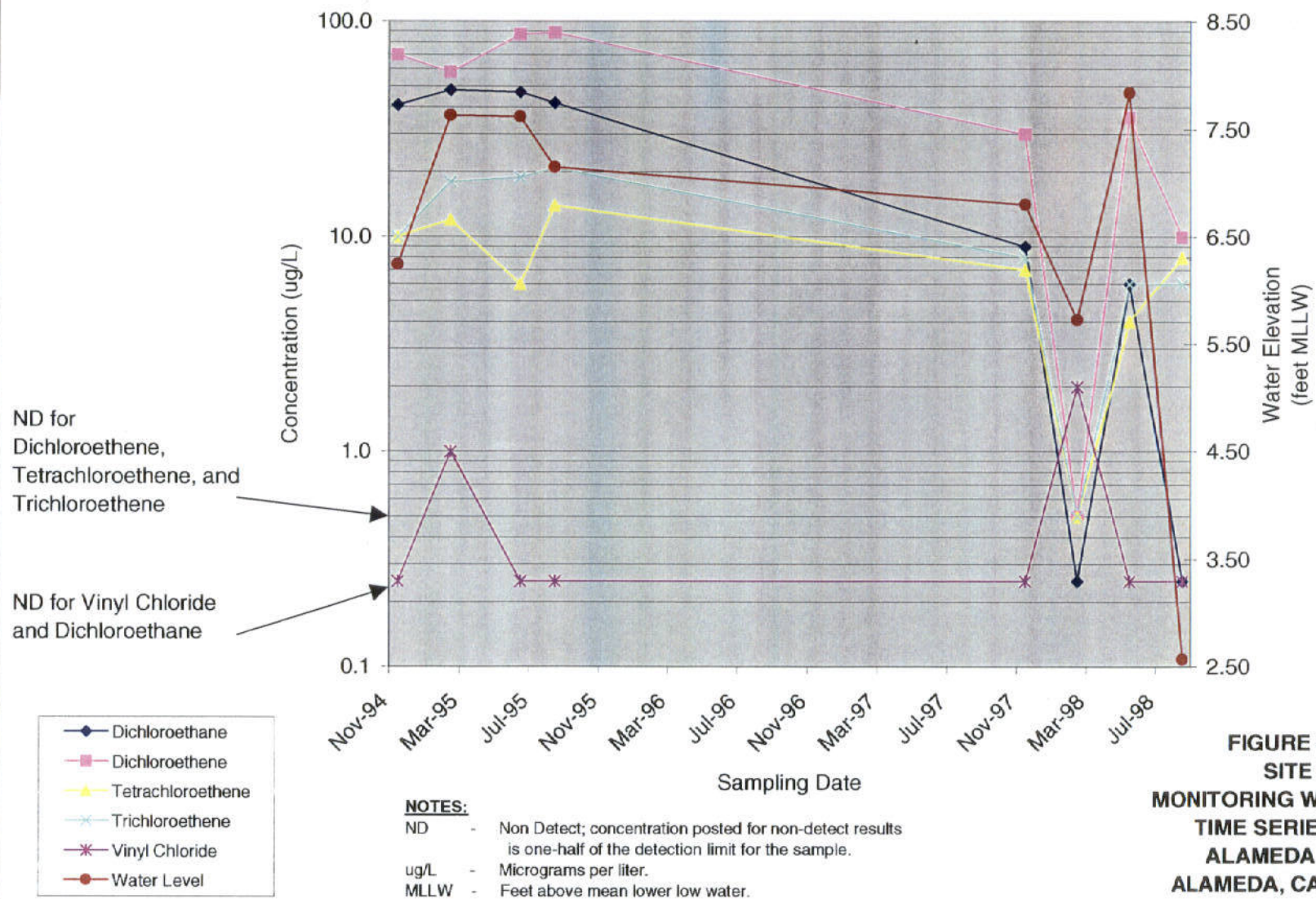
Notes:

mg/L = Milligrams per liter

NA = Not analyzed

ND = Not detected





**FIGURE 4.6-1**  
**SITE 6**  
**MONITORING WELL M06-06**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

Site 7 is located in the east-central portion of Alameda Point, near the base perimeter (Figure 1.2-2). The site has been a fuel station and auto repair shop since 1966. During operations, eight USTs were used at the site. Six of these USTs contained motor vehicle fuel. The two remaining tanks contained waste oil and solvent. Five of the fuel tanks and the waste oil tank were reported to have leaked at one time during their service (PRC and Montgomery Watson 1993c).

Currently, there are 14 active groundwater monitoring wells at Site 7, five of which were selected for quarterly sampling. During Quarters 3 and 4, however, four additional wells were sampled at Site 7, for a total of nine wells. Wells D07A-01, M07A-01, M07A-05, and M07A-08 were among seven wells from various sites added to the monitoring program. During prior sampling of the Site 7 wells, petroleum hydrocarbons (including VOCs) associated with the UST releases were detected.

Table 4.0-1 lists the five groundwater wells that were sampled at Site 7 during Quarters 1 and 2 and the nine wells that were sampled during Quarters 3 and 4, and identifies the parameters for which the samples were analyzed. The locations of these wells are shown on Figure 1.2-3.

#### 4.7.1 Sampling Plan Rationale

Well W-1 is located in the center of the petroleum hydrocarbon plume originating at Site 7. The remaining wells that were sampled at the site are located near the margins of the plume, which is migrating to the southeast.

Wells W-1 and M07A-04 are screened in the FWBZ. Well M07A-03 is screened in the BSA. Samples from these three wells were analyzed for VOCs. Samples from well D07A-02 and well M07A-09, screened in the SWBZ and the BSA, respectively, were also analyzed for VOCs. These two wells are located on the downgradient edge of the plume toward the southeast. Data from the VOC and petroleum hydrocarbon analyses (noted below) were collected to assess the migration of the petroleum hydrocarbon plume at Site 7. The four wells added for Quarters 3 and 4 are located northeast, north, and west of the groundwater plume. Three of these four wells are screened in the FWBZ (M07A-01, M07A-05, and M07A-08) and one well is screened in the SWBZ (D07A-01).

Samples from each of the Site 7 wells were also analyzed quarterly for metals and general water quality parameters. Data from these analyses were collected to complete a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from three of the original five wells (W-1 and M07A-04, screened in the FWBZ, and well M07A-03, screened in the BSA) and all four of the additional wells were analyzed for TPPH and TEPH.

Samples from each of the five original wells were analyzed for TOC during the first quarterly sampling event. The TOC data were collected to evaluate the biodegradation potential for the petroleum hydrocarbons found at Site 7; a high TOC concentration indicates a high biodegradation potential. Sections 4.7.2 through 4.7.5 present the analytical results for each quarter of sampling.

#### **4.7.2            Quarter 1 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one FWBZ well (W-1) during Quarter 1. This well is shown on Figure 4.1-1, Sheet 1, along with the FWBZ wells from various sites with detected organic compounds exceeding the MCLs. Inorganic constituents exceeded the MCLs in all five Site 7 wells sampled during Quarter 1, including M07A-04 and W-1, screened in the FWBZ, M07A-03 and M07A-09, screened in the BSA, and D07A-02, screened in the SWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1; SWBZ wells exceeding this criteria during Quarter 1 are shown on Figure 4.1-4, Sheet 1.

Table 4.7-1 presents a complete list of organic compounds detected in groundwater samples collected at Site 7 during Quarter 1. VOCs were detected only in well W-1. BTEX compounds were detected in both samples (the original sample and a duplicate sample) from W-1. Higher concentrations were exhibited in the original sample (benzene at 550  $\mu\text{g/L}$ , ethylbenzene at 820  $\mu\text{g/L}$ , toluene at 1,100  $\mu\text{g/L}$ , and xylene at 3,700  $\mu\text{g/L}$ ).

Groundwater samples from three Site 7 monitoring wells (M07A-03, M07A-04, and W-1) were analyzed for TEPH and TPPH during Quarter 1. Motor oil was detected in M07A-04, and diesel and gasoline were detected in W-1. The W-1 duplicate sample exhibited detected concentrations of diesel, motor oil, and gasoline. The original sample from W-1 exhibited the highest detected concentration of petroleum hydrocarbons at Site 7 (34 mg/L of gasoline).



Twelve metals were detected in one or more groundwater samples from the five Site 7 monitoring wells analyzed for metals during Quarter 1. Detected concentrations of antimony (in one well) arsenic (in five wells and one duplicate), barium (in five wells and one duplicate), cadmium (in four wells), chromium (in one well), cobalt (in four wells), manganese (in five wells and one duplicate), molybdenum (in three wells and one duplicate), nickel (in four wells), selenium (in two wells), vanadium (in two wells and one duplicate), and zinc (in two wells) are shown in Table 4.7-2.

All five of the Site 7 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. All five wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.7-3.

#### **4.7.3 Quarter 2 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one Site 7 FWBZ well (W-1) during Quarter 2, as shown on Figure 4.1-1, Sheet 2. Inorganic constituents exceeded the MCLs in all five Site 7 wells sampled during Quarter 2, including M07A-04 and W-1, screened in the FWBZ, M07A-03 and M07A-09, screened in the BSA, and D07A-02, screened in the SWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs during Quarter 2 sampling are shown on Figure 4.1-3, Sheet 2; SWBZ wells exceeding this criteria during Quarter 2 are shown on Figure 4.1-4, Sheet 2.

Table 4.7-1 presents a list of the organic compounds detected in groundwater samples collected at Site 7 during Quarter 2. VOCs were detected in only one well, well W-1. BTEX compounds were detected at very high concentrations in the sample from W-1 (benzene 2,400  $\mu\text{g/L}$ , ethylbenzene 2,100  $\mu\text{g/L}$ , toluene 8,800  $\mu\text{g/L}$ , and total xylenes 16,000  $\mu\text{g/L}$ ). These Quarter 2 concentrations are more than twice the concentrations of BTEX compounds detected during Quarter 1.

Groundwater samples from three Site 7 monitoring wells (M07A-03, M07A-04, and W-1) were analyzed for TEPH and TPPH during Quarter 2. Motor oil was detected in groundwater from all three wells and one duplicate sample from M07A-04 at concentrations ranging from 0.17 to 0.56 mg/L. Diesel was also detected in groundwater from all three wells (but not the duplicate sample) at concentrations ranging from 0.076 to 7.2 mg/L. Gasoline was detected in groundwater from well W-1 at a concentration of 49 mg/L.

The groundwater sample from W-1 exhibited the highest detected concentration of petroleum hydrocarbons at Site 7.

Eleven metals were detected in one or more groundwater samples from the five Site 7 monitoring wells analyzed for metals during Quarter 2. Detected concentrations of arsenic (in three wells and one duplicate), barium (in all five wells and one duplicate), cadmium (in four wells and one duplicate), chromium (in three wells), cobalt (in all five wells and one duplicate), manganese (in all five wells and one duplicate), molybdenum (in three wells), nickel (in all five wells and one duplicate), silver (in three wells), vanadium (in one well), and zinc (in four wells and one duplicate) are shown in Table 4.7-2.

All five of the Site 7 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.7-3.

#### **4.7.4 Quarter 3 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one Site 7 FWBZ well (W-1) during Quarter 3, as shown on Figure 4.1-1, Sheet 3. Inorganic constituents exceeded the MCLs in all nine Site 7 wells sampled during Quarter 3, including M07A-01, M07A-04, and W-1, screened in the FWBZ, M07A-03, M07A-05, M07A-08, and M07A-09, screened in the BSA, and D07A-01 and D07A-02, screened in the SWBZ. The FWBZ and BSA wells with detected inorganic constituents exceeding the MCLs during Quarter 3 are shown on Figure 4.1-3, Sheet 3, while SWBZ wells exceeding this criteria are shown on Figure 4.1-4, Sheet 3.

Table 4.7-1 presents a list of the organic compounds detected in groundwater samples collected at Site 7 during Quarter 3. VOCs were detected in only two wells (M07A-01 and W-1). BTEX compounds were detected at high concentrations in the sample from W-1 (benzene 560  $\mu\text{g/L}$ , ethylbenzene 240  $\mu\text{g/L}$ , toluene 500  $\mu\text{g/L}$ , and total xylenes 970  $\mu\text{g/L}$ ). These concentrations were significantly lower than the concentrations of BTEX compounds detected during Quarter 2 and, except for the benzene, less than half the Quarter 1 concentrations. Carbon disulfide was detected at a relatively low concentration (2  $\mu\text{g/L}$ ) in well M07A-05.

Groundwater samples from seven monitoring wells were analyzed for TEPH and TPPH during Quarter 3. One or more TPH compounds were detected in groundwater from five of the wells including the original sample from well M07A-01, but were not detected in its duplicate sample. Diesel was detected in five

wells (M07A-01, M07A-03, M07A-04, M07A-05, and W-1) at concentrations ranging from 0.074 to 5.6 mg/L. Motor oil was detected in groundwater from four wells (M07A-01, M07A-03, M07A-04, and M07A-05) at concentrations ranging from 0.29 to 0.72 mg/L. Gasoline was detected in groundwater from three wells (D07A-01, M07A-03, and W-1) at concentrations ranging from 0.048 mg/L to 130 mg/L. The groundwater sample from W-1 exhibited the highest detected concentration of petroleum hydrocarbons at Site 7.

Thirteen metals were detected in one or more groundwater samples from the nine Site 7 monitoring wells analyzed for metals during Quarter 3. Detected concentrations of antimony (in one well), arsenic (in all nine wells, but only one duplicate), barium (in three wells and two duplicates), cadmium (in eight wells and one duplicate), chromium (in four wells and one duplicate), cobalt (in eight wells and two duplicates), manganese (in all nine wells and both duplicates), molybdenum (in eight wells, but only one duplicate), nickel (in all nine wells and both duplicates), silver (in one well, but not its duplicate sample), thallium (in one well), vanadium (in four wells), and zinc (in three wells and two duplicates) are shown in Table 4.7-2.

All nine of the Site 7 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.7-3.

#### **4.7.5 Quarter 4 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one Site 7 FWBZ well (W-1) during Quarter 4, as shown on Figure 4.1-1, Sheet 4. Inorganic constituents exceeded the MCLs in all nine Site 7 wells sampled during Quarter 4, including M07A-01, M07A-04, and W-1, screened in the FWBZ, M07A-03, M07A-05, M07A-08, and M07A-09, screened in the BSA, and D07A-01 and D07A-02, screened in the SWBZ. The FWBZ and BSA wells with detected inorganic constituents exceeding the MCLs during Quarter 4 are shown on Figure 4.1-3, Sheet 4; SWBZ wells exceeding this criteria during Quarter 4 are shown on Figure 4.1-4, Sheet 4.

Table 4.7-1 presents a list of the organic compounds detected in groundwater samples collected at Site 7 during Quarter 4. VOCs were detected in one well (W-1). BTEX compounds were detected in the sample from well W-1 (benzene at 110 µg/L, ethylbenzene at 67 µg/L, toluene 78 µg/L, and total xylenes at 350 µg/L). These concentrations are less than half the concentrations of BTEX compounds detected

during the previous quarters and significantly less than the elevated concentrations detected during Quarter 2.

Groundwater samples from six monitoring wells (M07A-01, M07A-03, M07A-04, M07A-05, D07A-01, and W-1) were analyzed for TEPH and TPPH during Quarter 4. One or more TPH compounds were detected in groundwater from three of the wells. Diesel was detected in three wells (M07A-01, M07A-05, and W-1) at concentrations ranging from 0.14 to 0.72 mg/L. Motor oil was detected in groundwater from two wells (M07A-01, and W-1) at concentrations of 0.56 and 0.20 mg/L, respectively. Gasoline was detected in groundwater from well W-1 at a concentration of 35 mg/L. The groundwater sample from well W-1 consistently exhibited the highest detected concentration of petroleum hydrocarbons at Site 7.

Eleven metals were detected in one or more groundwater samples from seven Site 7 monitoring wells analyzed for metals during Quarter 4. Detected concentrations of antimony (in one well), arsenic (in four wells), barium (in all nine wells and one duplicate), cadmium (in one well and one duplicate), chromium (in four wells), cobalt (in nine wells and one duplicate), manganese (in eight wells and one duplicate), nickel (in one well), thallium (in two wells), vanadium (in three wells), and zinc (in four wells and one duplicate) are shown in Table 4.7-2.

All nine of the Site 7 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.7-3.

#### **4.7.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Site 7, changes in chemical type and concentration were followed over a period from 1994 through 1998. Time-series plots were prepared for two monitoring wells at Site 7, located within and adjacent to the groundwater contaminant plume depicted in Figures 6-5 and 6-6. The time-series plots present a more diverse group of chemicals than the three representative chemicals shown in the contaminant plume in Figures 6-5 and 6-6. Figures 4.7-1 and 4.7-2 depict time-series plots for monitoring wells M07A-04 and W-1 associated with a petroleum plume with low levels of a single chlorinated solvent.

Monitoring well W-1 (Figure 4.7-1) is located within a petroleum contaminant plume depicted in Figures 6-5 and 6-6. Petroleum concentrations within well W-1 have increased slightly over the four year time



frame, increasing dramatically during periods of precipitation and decreasing slowly during the dry summer months. This behavior suggests that residual petroleum products continue to be flushed from the overlying soil or capillary fringe in response to infiltrating rainwater. Monitoring well M07A-04 (Figure 4.7-2) is located north of the petroleum plume. Concentrations of DCA have decreased to reporting limits over the four year time frame. The source of the chlorinated solvent may be related to a former underground storage tank containing waste oil.

TABLE 4.7-1  
SITE 7  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07A-02	108-S07-002	11/11/97	ACETONE: R	NA	NA	NA	NA
M07A-03	108-S07-003	11/05/97	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
M07A-04	108-S07-006	11/06/97	ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.3Y	NA
M07A-09	108-S07-001	11/06/97	ND	NA	NA	NA	NA
W1	108-S07-004	11/05/97	2-BUTANONE: R ACETONE: R BENZENE: 550J ETHYLBENZENE: 820J TOLUENE: 1100J XYLENE (TOTAL): 3700J	NA	NA	DIESEL RANGE ORGANICS: 3J GASOLINE RANGE ORGANICS: 34J	NA
W1	108-S07-005*	11/05/97	2-BUTANONE: R ACETONE: R BENZENE: 310J ETHYLBENZENE: 460J TOLUENE: 560J XYLENE (TOTAL): 2100J	NA	NA	DIESEL RANGE ORGANICS: 3J MOTOR OIL RANGE ORGANICS: 0.5Y GASOLINE RANGE ORGANICS: 21J	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	ND = Not detected
R = Rejected	* = Duplicate sample

**TABLE 4.7-1**  
**SITE 7**  
**QUARTER 2**  
**ORGANIC COMPOUNDS DETECTED IN GROUNDWATER**  
**ALAMEDA POINT**  
**(Page 1 of 1)**

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07A-02	108-S07-007	02/04/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M07A-03	108-S07-008	02/05/98	2-BUTANONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.093J MOTOR OIL RANGE ORGANICS: 0.17J	NA
M07A-04	108-S07-009	02/05/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.076J MOTOR OIL RANGE ORGANICS: 0.56J	NA
M07A-04	108-S07-010	02/05/98	2-BUTANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.47J	NA
M07A-09	108-S07-011	02/05/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
W-1	108-S07-012	02/05/98	2-BUTANONE: R ACETONE: R BENZENE: 2400 ETHYLBENZENE: 2100 TOLUENE: 8800J XYLENE (TOTAL): 16000J	NA	NA	DIESEL RANGE ORGANICS: 7.2J MOTOR OIL RANGE ORGANICS: 0.51J GASOLINE RANGE ORGANICS: 49	NA

**Notes:**

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.7-1  
SITE 7  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07A-01	108-S07-019	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	GASOLINE RANGE ORGANICS: 0.048J	NA
D07A-02	108-S07-013	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
D07A-02	108-S07-014	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M07A-01	108-S07-020	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.074J MOTOR OIL RANGE ORGANICS: 0.29J	NA
M07A-01	108-S07-021	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
M07A-03	108-S07-015	05/05/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.20J MOTOR OIL RANGE ORGANICS: 0.29J GASOLINE RANGE ORGANICS: 0.03J	NA
M07A-04	108-S07-016	05/04/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.10J MOTOR OIL RANGE ORGANICS: 0.72J	NA
M07A-05	108-S07-022	05/04/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R CARBON DITSULFIDE: 2	NA	NA	DIESEL RANGE ORGANICS: 0.36J MOTOR OIL RANGE ORGANICS: 0.37J	NA
M07A-08	108-S07-023	05/05/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
M07A-09	108-S07-017	05/05/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
W1	108-S07-018	05/06/98	2-BUTANONE: R ACETONE: R BENZENE: 560 ETHYLBENZENE: 240 TOLUENE: 500 XYLENE (TOTAL): 970	NA	NA	DIESEL RANGE ORGANICS: 5.6J GASOLINE RANGE ORGANICS: 130J	NA

Notes:  
µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected  
\* Field duplicate samples: 108-S07-020 / 108-S07-021  
\* Field duplicate samples: 108-S07-013 / 108-S07-014

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected



TABLE 4.7-1  
SITE 7  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07A-01	108-S07-029	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
D07A-02	108-S07-030	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA
D07A-02	108-S07-031	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA
M07A-01	108-S07-032	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.14J MOTOR OIL RANGE ORGANICS: 0.56J	NA
M07A-03	108-S07-033	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: R MOTOR OIL RANGE ORGANICS: R	NA
M07A-04	108-S07-034	08/06/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: R MOTOR OIL RANGE ORGANICS: R	NA
M07A-05	108-S07-035	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.15J MOTOR OIL RANGE ORGANICS: R	NA
M07A-08	108-S07-036	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: R MOTOR OIL RANGE ORGANICS: R	NA
M07A-09	108-S07-037	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA
W-1	108-S07-038	08/06/98	2-BUTANONE: R 2-HEXANONE: R BENZENE: 110J ETHYLBENZENE: 67J TOLUENE: 78J XYLENE (TOTAL): 350J	NA	NA	DIESEL RANGE ORGANICS: 0.72J MOTOR OIL RANGE ORGANICS: 0.20J GASOLINE RANGE ORGANICS: 35J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected

TABLE 4.7-2  
SITE 7  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D07A-02	108-S07-002	11/11/97	<0.65	30.5	1890	<0.15	7.9	<0.30	5.8J	<0.65	<3.2	6880	<0.10	<0.30	7.1J	<1.0	<0.35	<9.0	<0.40	36.5
M07A-03	108-S07-003	11/05/97	14.6	398	151	<0.15	2.0J	2.4J	2.2J	<0.65	<3.2	163	<0.10	10.0	10.3	2.1J	<0.35	<9.0	27.2	89.9
M07A-04	108-S07-006	11/06/97	<0.65	10.8	460	<0.15	<0.66	<0.30	<0.40	<0.65	<0.65	1510	<0.10	<0.54	11.1	<1.0	<0.35	<4.5	<0.40	<10.0
M07A-09	108-S07-001	11/06/97	<5.1	51.7	234	<0.15	1.5J	<0.67	3.4J	<0.65	<3.2	1640	<0.10	7.7	15.3	1.2J	<0.35	<4.5	39.6	<14.0
W1	108-S07-004	11/05/97	<1.6	104	124	<0.15	0.90J	<0.59	0.56J	<0.65	<0.65	3640	<0.10	4.8J	<2.6	<1.0	<0.35	<0.90	<0.78	<11.2
W1	108-S07-005*	11/05/97	<1.9	92.1	133	<0.15	<0.56	<0.92	<0.40	<0.65	<0.65	3520	<0.10	4.5J	<2.4	<1.0	<0.35	<0.90	3.4J	<7.7

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
\* = Duplicate sample

TABLE 4.7-2  
SITE 7  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
D07A-02	108-S07-007	02/04/98	<0.89	<3.0	1860	<0.10	2.6	<0.20	7.3J	<1.5	<3.0	6490	<0.10	<0.25	9.6	<2.0	0.38J	<6.5	<0.30	255
M07A-03	108-S07-008	02/05/98	<1.2	26.3	202	<0.10	<0.20	5.2	2.8J	<0.86	<60.0	125	<0.10	0.82J	2.0J	<0.90	<0.15	<7.0	15.5J	<11.3
M07A-04	108-S07-009	02/05/98	<0.70	8.4	385	<0.10	0.38J	0.54J	0.41J	<0.40	<0.60	1280	<0.10	<0.50	7.7J	<0.90	0.16J	<1.4	<0.30	59.4
M07A-04	108-S07-010	02/05/98	<0.70	8.2	477	<0.10	0.62J	<0.20	0.66J	<0.57	<0.60	1330	<0.10	<0.32	8.5	<0.90	<0.15	<7.0	<0.30	48.6
M07A-09	108-S07-011	02/05/98	<0.70	<1.2	31.9J	<0.10	0.25J	<0.20	0.45J	<3.6	<0.60	423	<0.10	3.6J	3.3J	<0.90	<0.15	<7.0	<0.30	75.3
W-1	108-S07-012	02/05/98	<1.7	90.5	94.7J	<0.10	0.35J	0.95J	0.28J	<0.37	<1.1	5120	<0.10	5.7	2.6J	<1.3	0.58J	<1.4	<3.4	190

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.7-2  
SITE 7  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	UANIUM	ZINC
			(µg/L)																	
D07A-01	108-S07-019	05/12/98	<0.85	9.8	1430	<0.10	<0.30	<0.35	0.78J	<2.3	<2.5	6190	<0.10	0.64J	3.0J	R	<0.30	<7.0	<2.8	125
D07A-02	108-S07-013	05/12/98	<0.85	1.9J	1740	<0.10	2.5	<0.35	6.3J	<4.2	<2.5	6250	<0.10	<0.50	9.0	<4.2	0.30J	<7.0	<0.25	387
D07A-02	108-S07-014	05/12/98	<0.85	<1.0	2130	<0.10	3.1	<0.35	6.9J	<5.5	<2.5	6700	<0.10	0.72J	9.4	<4.2	<0.30	<7.0	<0.25	525
M07A-01	108-S07-020	05/12/98	<0.85	17.7	629	<0.10	0.83J	0.48J	0.89J	<3.4	<0.50	829	<0.10	2.4J	9.4	<0.85	<0.30	<1.4	4.9J	132
M07A-01	108-S07-021	05/12/98	<0.85	10.1	225	<0.10	<0.25	0.64J	0.44J	<2.2	<0.50	840	<0.10	2.5J	8.3	R	<0.30	<1.4	<3.6	29.8
M07A-03	108-S07-015	05/05/98	<2.4	30.2	<581	<0.10	0.56J	<0.35	2.1J	<3.4	<9.0	629	<0.10	0.54J	7.3J	R	<0.30	7.3J	18.8J	<159
M07A-04	108-S07-016	05/04/98	<0.85	7.8	<624	<0.10	0.62J	<0.35	0.43J	<2.3	<0.90	1160	<0.10	<0.50	8.3	R	<0.30	<1.4	<0.25	<111
M07A-05	108-S07-022	05/04/98	7.2J	32.4	<556	<0.10	0.25J	0.36J	2.4J	<2.1	<1.1	320	<0.10	13.3	16.8	R	<0.30	<7.0	34.3	<122
M07A-08	108-S07-023	05/05/98	<0.85	10.7	<396	<0.10	0.74J	1.0J	0.35J	<2.7	<0.90	812	<0.10	3.1J	3.9J	R	<0.30	<1.4	<1.9	<124
M07A-09	108-S07-017	05/05/98	<1.2	3.6J	<291	<0.10	0.38J	<0.35	<0.30	<5.5	<0.90	106	<0.10	2.4J	4.5J	R	<0.30	<1.4	2.7J	<147
W1	108-S07-018	05/06/98	<0.85	88.5	<456	<0.10	0.61J	0.90J	0.52J	<2.2	<0.90	3650	<0.10	2.1J	3.4J	R	<0.30	<1.4	<0.82	<137

Notes:  
µg/L = Micrograms per liter  
J = Value estimated at reported concentration  
\* Field duplicate samples: 108-S07-020 / 108-S07-021  
\* Field duplicate samples: 108-S07-013 / 108-S07-014

< = Parameter reported below reporting limit  
R = Rejected



TABLE 4.7-2  
SITE 7  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
D07A-01	108-S07-029	08/06/98	<1.8	<6.1	931	<0.20	<0.30	<0.80	2.6J	<0.60	<1.7	6100	<0.10	<1.0	<6.6	<2.2	<0.70	<2.8	<0.60	13.5J
D07A-02	108-S07-030	08/06/98	<2.2	<5.5	1570	<0.20	3.1J	<0.80	9.4J	<3.4	<1.7	6020	<0.10	<1.0	<12.0	<2.2	<0.70	<7.0	<0.60	1060
D07A-02	108-S07-031	08/06/98	<3.3	<3.9	1600	<0.20	2.7J	<0.80	7.4J	<1.3	<1.7	6170	<0.10	<1.0	<9.5	<2.2	<0.70	<7.0	<0.60	836
M07A-01	108-S07-032	08/10/98	2.9J	<12.9	515	<0.20	<0.30	<0.80	3.7J	<2.4	<1.7	824	<0.10	<1.0	10.2	<2.2	<0.70	<5.5	<1.5	10.9J
M07A-03	108-S07-033	08/06/98	<2.8	<10.4	241	<0.20	<0.30	4.9J	4.8J	<0.60	<1.7	229	<0.10	<1.0	<2.4	<2.2	<0.70	8.1J	14.2J	<5.4
M07A-04	108-S07-034	08/06/98	<5.2	12.3	399	<0.20	<0.30	<0.80	2.4J	<0.60	<2.2	1350	<0.10	<1.0	<8.7	<2.2	<0.70	<7.0	<0.60	<8.9
M07A-05	108-S07-035	08/06/98	<5.4	<9.5	184J	<0.20	<0.30	6.7J	2.9J	<0.60	<8.5	<0.30	<0.10	<1.0	<3.1	<2.2	<0.70	19.6J	20.2J	<4.4
M07A-08	108-S07-036	08/06/98	<1.8	13.6	465	<0.20	<0.30	1.6J	3.3J	<0.60	<1.7	1710	<0.10	1.8J	<2.8	<2.2	<0.70	<7.0	<4.6	<2.6
M07A-09	108-S07-037	08/06/98	<1.8	14.4	271	<0.20	<0.30	<0.80	3.9J	<0.60	<1.7	2020	<0.10	<1.0	<2.3	<2.2	<0.70	<7.0	<3.8	9.5J
W-1	108-S07-038	08/06/98	<1.8	38.1	97.7J	<0.20	<0.30	6.6J	3.8J	<0.60	<1.7	1500	<0.10	<1.0	<2.8	<2.2	<0.70	<7.0	11.0J	<8.1

Notes:

$\mu\text{g/L}$  = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.7-3  
SITE 7  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07A-02	108-S07-002	11/11/97	Alkalinity: 1240 Bicarbonate: 1240	Bromide: 47.5 Chloride: 10600 Sulfate: 152	Total Dissolved Solids: 17000	ND	Total Organic Carbon: 7
M07A-03	108-S07-003	11/05/97	Alkalinity: 3170 Bicarbonate: 3170	Bromide: 79.8 Chloride: 19400 Phosphate: 12.3	Total Dissolved Solids: 2800	Total Sulfide: 1	TOC Test 2: 90 Total Organic Carbon: 100
M07A-04	108-S07-006	11/06/97	Alkalinity: 1090 Bicarbonate: 1090	Bromide: 17.8 Chloride: 3930 Sulfate: 2.3	Total Dissolved Solids: 7200	ND	TOC Test 2: 30 Total Organic Carbon: 31
M07A-09	108-S07-001	11/06/97	Alkalinity: 2460 Bicarbonate: 2460	Bromide: 50.5 Chloride: 10400 Phosphate: 1.7 Sulfate: 42.3	Total Dissolved Solids: 19000	ND	TOC Test 2: 54 Total Organic Carbon: 62
W1	108-S07-004	11/05/97	Alkalinity: 1820 Bicarbonate: 1820	Bromide: 8.4 Chloride: 1640 Sulfate: 0.37	Total Dissolved Solids: 480	ND	TOC Test 2: 27 Total Organic Carbon: 28

Notes:

mg/L = Milligrams per liter

ND = Not detected

TABLE 4.7-3  
SITE 7  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
D07A-02	108-S07-007	02/04/98	Alkalinity: 1230 Bicarbonate: 1230	Bromide: 40.4 Chloride: 10200 Nitrate: 1.7 Sulfate: 143	Total Dissolved Solids: 18000 J
M07A-03	108-S07-008	02/05/98	Alkalinity: 3170 Bicarbonate: 3170	Bromide: 60.3 Chloride: 23500 Fluoride: 0.47 Nitrate: 18 Phosphate: 20.2 Sulfate: 20.5	Total Dissolved Solids: 29000
M07A-04	108-S07-009	02/05/98	Alkalinity: 1320 Bicarbonate: 1320	Bromide: 15.1 Chloride: 2440 Fluoride: 0.59 Sulfate: 33.1	Total Dissolved Solids: 8200
M07A-09	108-S07-011	02/05/98	Alkalinity: 226 Bicarbonate: 226	Bromide: 1.5 Chloride: 3820 Fluoride: 0.47 Sulfate: 389	Total Dissolved Solids: 4300
W1	108-S07-012	02/05/98	Alkalinity: 574 Bicarbonate: 574	Bromide: 1.6 Chloride: 272 Fluoride: 0.26 Sulfate: 24.9	Total Dissolved Solids: 1400

Notes:

mg/L

= Milligram per liter

J

= Value estimated at reported concentration

TABLE 4.7-3  
SITE 7  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 2)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07A-01	108-S07-019	05/12/98	Alkalinity: 1090 Bicarbonate: 1090	Bromide: 31.3 Chloride: 12200 Sulfate: 771 J	Total Dissolved Solids: 16000	ND	TOC Test 2: 7.4 J Total Organic Carbon: 7.4 J
D07A-02	108-S07-013	05/12/98	Alkalinity: 1180 Bicarbonate: 1180	Bromide: R Chloride: 10700 Sulfate: 131	Total Dissolved Solids: 21000	ND	NA
M07A-01	108-S07-020	05/12/98	Alkalinity: 1490 Bicarbonate: 1490	Bromide: R Chloride: 4990 Nitrate-N: 3.1 Sulfate: 15.5	Total Dissolved Solids: 8400	ND	TOC Test 2: 40.6 J Total Organic Carbon: 41.9 J
M07A-03	108-S07-015	05/05/98	Alkalinity: 1930 Bicarbonate: 1930	Bromide: 61.2 Chloride: 15000 Sulfate: 62.4 J	Total Dissolved Solids: 20000	ND	NA
M07A-04	108-S07-016	05/04/98	Alkalinity: 927 Bicarbonate: 927	Bromide: 18.7 Chloride: 3280 Sulfate: 23.3	Total Dissolved Solids: 6000	ND	NA
M07A-05	108-S07-022	05/04/98	Alkalinity: 2930 Bicarbonate: 2930	Bromide: 61.4 Chloride: 16400 Sulfate: 8.1	Total Dissolved Solids: 18000	Total Sulfide: 4	TOC Test 2: 49.4 Total Organic Carbon: 50.5
M07A-08	108-S07-023	05/05/98	Alkalinity: 430 Bicarbonate: 430	Bromide: 8.7 Chloride: 1380 Sulfate: 203 J	Total Dissolved Solids: 3100	ND	TOC Test 2: 8.6 Total Organic Carbon: 8.8

TABLE 4.7-3  
SITE 7  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 2 of 2)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M07A-09	108-S07-017	05/05/98	Alkalinity: 305 Bicarbonate: 305	Bromide: 3.6 Chloride: 665 Nitrate-N: 3.9 Sulfate: 88.7 J	Total Dissolved Solids: 1300	ND	NA
W1	108-S07-018	05/06/98	Alkalinity: 741 Bicarbonate: 741	Bromide: 5.4 Chloride: 1200	Total Dissolved Solids: 2700	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected  
R = Rejected



TABLE 4.7-3  
SITE 7  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 2)

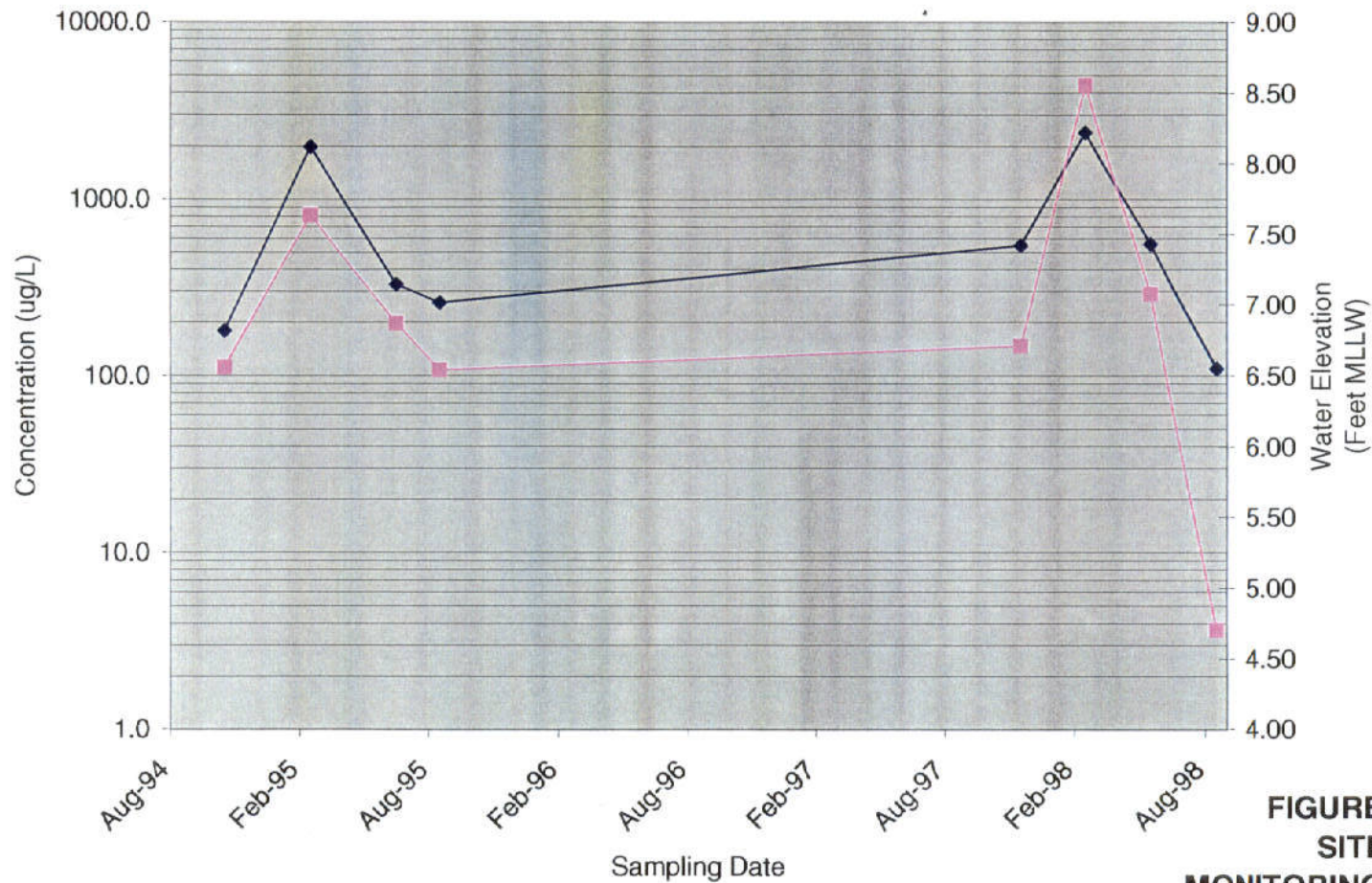
Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07A-01	108-S07-029	08/06/98	Alkalinity: 1080 Bicarbonate: 1080	Bromide: 7.0 Chloride: 7860 Sulfate: 567	Total Dissolved Solids: 18000	ND	NA
D07A-02	108-S07-030	08/06/98	Alkalinity: 1180 Bicarbonate: 1180	Bromide: 39.9 Chloride: 10200	Total Dissolved Solids: 22000	ND	NA
M07A-01	108-S07-032	08/10/98	Alkalinity: 4270 Bicarbonate: 4270	Bromide: 33.0 J Chloride: 5990 J Nitrate-N: 6.6 Sulfate: 16.2	Total Dissolved Solids: 15000	ND	NA
M07A-03	108-S07-033	08/06/98	Alkalinity: 2640 Bicarbonate: 2640	Bromide: 67.6 Chloride: 16300 Phosphate: 7.9 J Sulfate: 5.6	Total Dissolved Solids: 31000	Total Sulfide: 1.8	NA
M07A-04	108-S07-034	08/06/98	Alkalinity: 988 Bicarbonate: 988	Bromide: 16.0 Chloride: 2810 Sulfate: 13.7	Total Dissolved Solids: 6300	ND	NA
M07A-05	108-S07-035	08/06/98	Alkalinity: 4040 Bicarbonate: 4040	Bromide: 93.1 Chloride: 26300 Phosphate: 114 J Sulfate: 12.3	Total Dissolved Solids: 47000	Total Sulfide: 3.0	NA

TABLE 4.7-3  
SITE 7  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 2 of 2)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
W1	108-S07-038	08/06/98	Alkalinity: 1340 Bicarbonate: 1340	Bromide: 34.7 Chloride: 8990 Phosphate: 3.3 J Sulfate: 1.1	Total Dissolved Solids: 18000	Total Sulfide: 1.3	NA

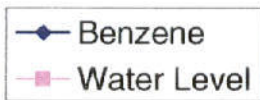
Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected

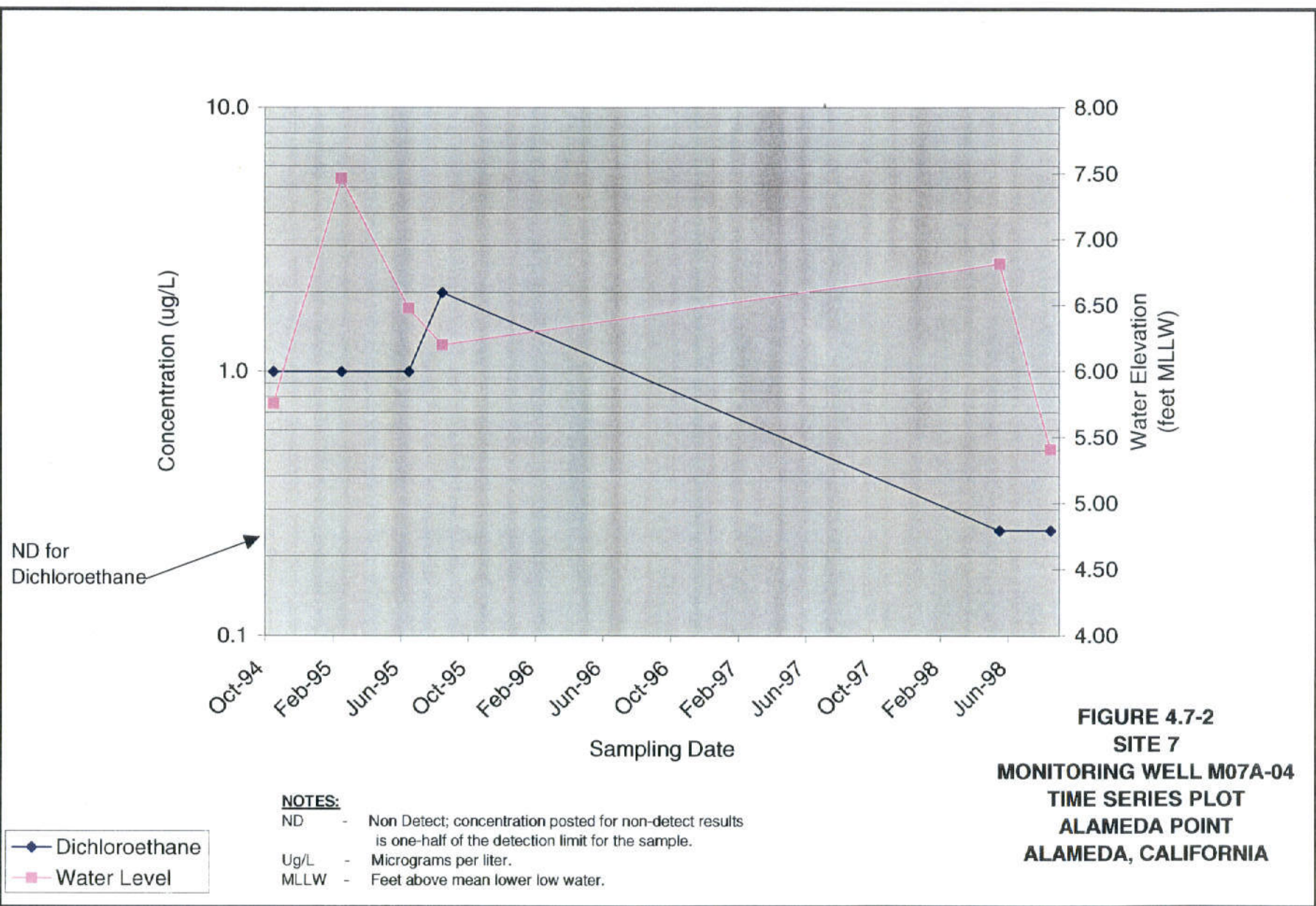


**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.



**FIGURE 4.7-1**  
**SITE 7**  
**MONITORING WELL W-1**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



Site 9 is located in the southeast portion of Alameda Point (Figure 1.2-2). Building 410, located on the site, housed an aircraft paint stripping operation until 1990. Solvents, paints, and oils were used at the site (PRC and Montgomery Watson 1993c).

Currently, there are seven active groundwater monitoring wells associated with Site 9, two of which were selected for quarterly sampling. During prior sampling of these wells, low concentrations of solvents in groundwater were detected at the site. Petroleum hydrocarbons, however, were not detected in these wells.

For each quarter, Table 4.0-1 lists the two groundwater wells that were sampled and identifies the parameters for which the samples were analyzed. The locations of these wells are shown on Figure 1.2-3.

#### **4.8.1 Sampling Plan Rationale**

Well M09-06 is screened in the FWBZ and well D09-01 is screened in the SWBZ. Samples from these wells were analyzed for VOCs. The VOC data were collected to monitor solvent concentrations at the site.

Samples from the two wells were also analyzed for metals and general water quality parameters. Data from these analyses were collected to complete a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from each of the wells were analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential. Sections 4.8.2 through 4.8.5 present the analytical results for each quarter of sampling.

#### **4.8.2 Quarter 1 Analytical Results**

No compounds were detected at concentrations exceeding the MCLs in groundwater from the two Site 9 monitoring wells during Quarter 1. Inorganic constituents exceeded the MCLs in one of the two Site 9



wells (D09-01, screened in the SWBZ) during Quarter 1 sampling. The SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-4, Sheet 1.

Organic analytical results for compounds detected in groundwater samples collected at Site 9 are presented in Table 4.8-1. VOCs were the only organics analyses conducted on the samples collected from the Site 9 monitoring wells and there were no detections.

Seven metals were detected in one or more groundwater samples from the two Site 9 monitoring wells analyzed for metals during Quarter 1. Detected concentrations of barium (in two wells and one duplicate), cadmium (in one well), cobalt (in one well), manganese (in two wells and one duplicate), nickel (in one well), selenium (in one well), and zinc (in one well) are shown in Table 4.8-2.

Both Site 9 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. Both wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.8-3.

#### **4.8.3 Quarter 2 Analytical Results**

No organic compounds were detected at concentrations exceeding the MCLs in groundwater from the two Site 9 monitoring wells during Quarter 2. Inorganic constituents exceeded the MCLs in one of the two Site 9 wells (D09-01, screened in the SWBZ) during Quarter 2 sampling. The SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-4, Sheet 2.

Organic analytical results for compounds detected in groundwater samples collected at Site 9 during Quarter 2 are presented in Table 4.8-1. VOCs were the only organics analyses conducted on the samples collected from the Site 9 monitoring wells and PCE was the only VOC detected. PCE was detected in groundwater at a concentration of 2 µg/L in the duplicate sample collected from well M09-06.

Seven metals were detected in one or more groundwater samples from the two Site 9 monitoring wells analyzed for metals during Quarter 2. Detected concentrations of barium (in two wells and one duplicate), cadmium (in two wells and one duplicate), chromium (in one well and one duplicate), cobalt (in two wells and one duplicate), manganese (in one well), nickel (in two wells and one duplicate), and silver (in one well) are shown in Table 4.8-2.

Both Site 9 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.8-3.

#### **4.8.4 Quarter 3 Analytical Results**

No organic compounds were detected at concentrations exceeding the MCLs in groundwater from the two Site 9 monitoring wells during Quarter 3. Inorganic constituents exceeded the MCLs in both of the Site 9 wells during Quarter 3 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 3 and 4.1-4, Sheet 3, respectively.

Organic analytical results for compounds detected in groundwater samples collected at Site 9 are presented in Table 4.8-1. VOCs were the only organics analyses conducted on the samples collected from the Site 9 monitoring wells and no VOCs were detected in these samples during Quarter 3.

Eight metals were detected in one or more groundwater samples from the two Site 9 monitoring wells analyzed for metals during Quarter 3. Detected concentrations of antimony (in a duplicate sample), barium (in two wells and one duplicate), cadmium (in one well and one duplicate), chromium (in one well), cobalt (in two wells and one duplicate), manganese (in two wells and one duplicate), nickel (in two wells and one duplicate), and zinc (in two wells and one duplicate) are shown in Table 4.8-2.

Both Site 9 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.8-3.

#### **4.8.5 Quarter 4 Analytical Results**

No organic compounds were detected at concentrations exceeding the MCLs in groundwater from the two Site 9 monitoring wells during Quarter 4. Inorganic constituents exceeded the MCLs in one of the two Site 9 wells (D09-01, screened in the SWBZ) during Quarter 4 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 4 and 4.1-4, Sheet 4, respectively.

Organic analytical results for compounds detected in groundwater samples collected at Site 9 are presented in Table 4.8-1. VOCs were the only organics analyses conducted on the samples collected from the Site 9 monitoring wells and chloroform was the only VOC detected in these samples. Chloroform

was detected at a concentration of 2  $\mu\text{g/L}$  in the sample from well D09-01 and in the duplicate sample from this well.

Seven metals were detected in one or more groundwater samples from the two Site 9 monitoring wells analyzed for metals during Quarter 4. Detected concentrations of barium (in both wells and one duplicate), cadmium (in one well and one duplicate), chromium (in one well), cobalt (in one well and one duplicate), manganese (in both wells and one duplicate), vanadium (in one well), and zinc (in both wells and one duplicate) are shown in Table 4.8-2.

Both Site 9 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.8-3.

TABLE 4.8-1  
SITE 9  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D09-01	108-S09-003	11/11/97	ACETONE: R	NA	NA	NA	NA
M09-06	108-S09-001	11/05/97	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M09-06	108-S09-002*	11/05/97	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
\* = Duplicate sample

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.8-1  
SITE 9  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D09-01	108-S09-004	02/04/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M09-06	108-S09-005	02/05/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M09-06	108-S09-006	02/05/98	2-BUTANONE: R ACETONE: R TETRACHLOROETHENE: 2	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.8-1  
SITE 9  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D09-01	108-S09-007	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
D09-01	108-S09-008	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M09-06	108-S09-009	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter

mg/L = Milligrams per liter

NA = Not analyzed

\* Field duplicate samples: 108-S09-007 / 108-S09-008

PCBs = Polychlorinated biphenyls

J = Value estimated at reported concentration

R = Rejected



TABLE 4.8-1  
SITE 9  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D09-01	108-S09-010	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R CHLOROFORM: 2J	NA	NA	NA	NA
D09-01	108-S09-011	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R CHLOROFORM: 2J	NA	NA	NA	NA
M09-06	108-S09-012	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.8-2  
SITE 9  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			( $\mu\text{g/L}$ )																	
D09-01	108-S09-003	11/11/97	<1.3	<5.2	66.1J	<0.30	7.2	<0.60	11.4J	<1.3	<65.0	17800	<0.10	<0.60	12.0J	2.7J	<1.6	<18.0	<0.80	21.6
M09-06	108-S09-001	11/05/97	<1.2	<1.0	115	<0.15	<0.15	<2.2	<0.40	<0.65	<0.65	4.8J	<0.10	<0.55	<5.2	<1.0	<0.35	<0.90	<1.6	<3.3
M09-06	108-S09-002*	11/05/97	<0.65	<1.0	112	<0.15	<0.30	<1.9	<0.40	<0.65	<0.65	4.6J	<0.10	<0.73	<4.8	<1.0	<0.35	<0.90	<1.7	<7.4

Notes:  
 $\mu\text{g/L}$  = Micrograms per liter  
J = Value estimated at reported concentration  
< = Parameter reported below reporting limit  
\* = Duplicate sample

TABLE 4.8-2  
SITE 9  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
D09-01	108-S09-004	02/04/98	<0.78	<0.88	20.7J	<0.10	8.7	<0.20	1.5J	<2.0	<3.0	2100	<0.10	<0.25	2.5J	<0.90	0.17J	<1.3	<0.30	<19.0
M09-06	108-S09-005	02/05/98	<0.70	<0.80	128	<0.10	0.50J	1.9J	0.36J	<1.1	<0.60	<2.3	<0.10	<0.25	8.6	<0.90	<0.15	<1.4	<1.6	<21.8
M09-06	108-S09-006	02/05/98	<0.70	<0.80	126	<0.10	0.62J	1.5J	0.38J	<1.2	<0.60	<4.0	<0.10	<0.25	8.9	<0.90	<0.15	<1.4	<1.6	<22.6

Notes:

$\mu\text{g/L}$  = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.8-2  
SITE 9  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D09-01	108-S09-007	05/13/98	<0.85	<1.0	260	<0.10	15.4	<0.35	1.5J	<5.4	<0.50	2070	<0.10	<0.50	2.9J	R	<0.30	<1.4	<1.0	136
D09-01	108-S09-008	05/13/98	0.85J	<1.0	47.7J	<0.10	14.8	<0.35	1.5J	<4.6	<0.50	1820	<0.10	<0.50	2.4J	R	<0.30	<1.4	<0.82	41.3
M09-06	108-S09-009	05/12/98	<0.85	<1.0	363	<0.10	<0.15	3.0J	0.58J	<2.6	<0.50	5.6J	<0.10	0.88J	7.2J	<0.85	<0.30	<1.4	<2.7	91.6

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

\* Field duplicate samples: 108-S09-007 / 108-S09-008

< = Parameter reported below reporting limit

R = Rejected

TABLE 4.8-2  
SITE 9  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
D09-01	108-S09-010	08/06/98	<3.4	<2.1	23.6J	<0.20	13.7	<0.80	6.2J	<2.8	<1.7	2800	<0.10	<1.0	<5.7	<2.2	<0.70	<1.4	<0.60	40.0
D09-01	108-S09-011	08/06/98	<3.7	<2.2	26.4J	<0.20	15.0	<0.80	3.3J	<2.6	<1.7	3380	<0.10	<1.0	<5.0	<2.2	<0.70	<7.0	<0.60	46.3
M09-06	108-S09-012	08/07/98	<1.8	<2.1	86.4J	<0.20	<0.30	1.8J	<2.5	<2.9	<1.7	9.0J	<0.10	<1.0	<4.3	<2.2	<0.70	<1.1	2.4J	11.4J

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.8-3  
SITE 9  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D09-01	108-S09-003	11/11/97	Alkalinity: 211 Bicarbonate: 211	Bromide: 65.2 Chloride: 15200 Sulfate: 2080	Total Dissolved Solids: 24000	ND	ND
M09-06	108-S09-001	11/05/97	Alkalinity: 183 Bicarbonate: 183	Bromide: 0.14 Chloride: 13.6 Nitrate-N: 1.1 Sulfate: 20.7	Total Dissolved Solids: 180 J	ND	TOC Test 2: 2

Notes:

mg/L = Milligrams per liter

ND = Not detected



TABLE 4.8-3  
SITE 9  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
D09-01	108-S09-004	02/04/98	Alkalinity: 61.2 Bicarbonate: 61.2	Bromide: 7.2 Chloride: 1920 Nitrate: 1.5 Sulfate: 244	Total Dissolved Solids: 4400 J
M09-06	108-S09-005	02/05/98	Alkalinity: 205 Bicarbonate: 205	Bromide: 0.18 Chloride: 16.6 Nitrate: 2 Sulfate: 36.8	Total Dissolved Solids: 740

Notes:

mg/L

= Milligram per liter

J

= Value estimated at reported concentration

TABLE 4.8-3  
SITE 9  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D09-01	108-S09-007	05/13/98	Alkalinity: 58.6 Bicarbonate: 58.6	Bromide: 6.2 Chloride: 2170 Nitrate-N: 1.4 Sulfate: 286 J	Total Dissolved Solids: 5800	ND	NA
M09-06	108-S09-009	05/12/98	Alkalinity: 203 Bicarbonate: 203	Bromide: R Chloride: 11.8 Fluoride: 0.13 J Nitrate-N: 1.3 Sulfate: 23.8	Total Dissolved Solids: 520	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected

TABLE 4.8-3  
SITE 9  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D09-01	108-S09-010	08/06/98	Alkalinity: 118 Bicarbonate: 118	Bromide: 18.1 Chloride: 4260 Nitrate-N: 1.1 Sulfate: 624	Total Dissolved Solids: 12000	ND	NA
M09-06	108-S09-012	08/07/98	Alkalinity: 216 Bicarbonate: 216	Chloride: 8.3 Nitrate-N: 0.99 Sulfate: 15.9	Total Dissolved Solids: 310	ND	NA

Notes:

mg/L = Milligrams per liter

NA = Not analyzed

ND = Not detected

#### **4.9 SITE 11 - BUILDING 14, AIRCRAFT ENGINE TEST CELL AND SITE 21 - SERVICE STATION**

Site 11 is located immediately east of the Seaplane Lagoon (Figure 1.2-2). Building 14, located on the site, was used as an aircraft engine test facility. Fuels, solvents, cleaning chemicals, and lubricants were used and stored at the site (PRC and Montgomery Watson 1993c). Site 21, a service station, is located immediately north of Site 11. Solvents have also been detected in samples from nearby Site 4, east of Sites 11 and 21. The possible interrelationship with the solvent plume at Site 4 is still being evaluated.

Currently, there are seven groundwater monitoring wells at Site 11, four of which were selected for quarterly sampling. One additional well, installed during the investigation at Site 21 (M07B-01), is included in the quarterly sampling program for Site 11. During prior sampling of these wells, solvents were detected in groundwater samples. Petroleum hydrocarbons were not detected in previous groundwater samples from the site.

Table 4.0-1 lists the five groundwater wells that were sampled at Sites 11 and 21 and identifies the parameters for which the samples were analyzed, by quarter. The locations of these wells are shown on Figure 1.2-3.

##### **4.9.1 Sampling Plan Rationale**

The five wells that were sampled at Sites 11 and 21 are screened in the FWBZ. Samples from these wells were analyzed for VOCs. The VOC data were collected to monitor solvent concentrations at the site and further evaluate the source of the solvents in groundwater. Data from the Site 3 well M03-05 (see Section 4.3 of this report) will also be used to assess the extent of solvents in groundwater and explore the relationship between the solvent plumes reported at Sites 4 and 11.

Samples from all five wells were analyzed for metals and general water quality parameters. Data from these analyses was collected to complete a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from each of the wells were analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration

indicates a high biodegradation potential. Sections 4.9.2 through 4.9.5 present the analytical results for each quarter of sampling.

#### **4.9.2 Quarter 1 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from two Site 11 monitoring wells (M11-02 and M11-06, screened in the FWBZ) and in the one Site 21 monitoring well (M07B-01, also screened in the FWBZ) during Quarter 1. These wells are shown on Figure 4.1-1, Sheet 1, along with all FWBZ wells with detected organic compounds exceeding the MCLs. Inorganic constituents exceeded the MCLs in all four Site 11 wells (M11-01, M11-02, M11-05, and M11-06) and in the Site 21 well (M07B-01) during Quarter 1 sampling; these five wells are screened in the FWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1.

Organic analytical results for compounds detected in groundwater samples collected at Sites 11 and 21 during Quarter 1, are presented in Table 4.9-1. VOCs were detected in three wells. Vinyl chloride was detected in wells M11-02, M11-06, and M07B-01, at concentrations ranging from 0.8  $\mu\text{g/L}$  to 2  $\mu\text{g/L}$ . In addition, 1,1-DCA was detected in wells M11-02 and M07B-01 at concentrations of 2  $\mu\text{g/L}$  and 1  $\mu\text{g/L}$ , respectively. The concentrations of organic contaminants in groundwater at Sites 11 and 21 are much lower than the concentrations detected in samples from nearby Site 4. Although detected at high concentrations at Site 4, TCE was not detected in the groundwater from Sites 11 or 21. Groundwater flow in the vicinity of Site 11 is toward the Seaplane Lagoon in a northwesterly direction (Figure 1.2-2).

Twelve metals were detected in one or more groundwater samples from the five Sites 11 and 21 monitoring wells analyzed for metals during Quarter 1. Detected concentrations of arsenic (in two wells), barium (in five wells and one duplicate), cadmium (in the duplicate), chromium (in one well), cobalt (in one well and one duplicate), copper (in one well and one duplicate) manganese (in five wells and one duplicate), molybdenum (in two wells), nickel (in four wells and one duplicate), selenium (in three wells), vanadium (in two wells), and zinc (in one well and one duplicate) are shown in Table 4.9-2.

All five Sites 11 and Site 21 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. All five wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.9-3.

#### 4.9.3

#### Quarter 2 Analytical Results

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from three Site 11 monitoring wells (M11-01, M11-02, and M11-06, screened in the FWBZ) during Quarter 2. These wells are shown on Figure 4.1-1, Sheet 2. No organic compounds were detected in the Site 21 monitoring well M07B-01. Inorganic constituents exceeded the MCLs during Quarter 2 sampling in two Site 11 wells, M11-01 and M11-05, but not the Site 21 well; these wells are screened in the FWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 2.

Organic analytical results for compounds detected in groundwater samples collected at Sites 11 and 21, during Quarter 2, are presented in Table 4.9-1. VOCs were detected in three wells. Vinyl chloride was detected in wells M11-01 and M11-06 at concentrations of 0.6  $\mu\text{g/L}$  and 0.9  $\mu\text{g/L}$ , respectively. TCE was also detected in three wells at concentrations ranging from 2 to 12  $\mu\text{g/L}$ . In addition, 1,1,1-TCA, 1,1-DCA, and cis-1,2-DCE were detected in well M11-02. Compared to the concentrations detected in samples from nearby Site 4, concentrations of organic contaminants in groundwater at Sites 11 and 21 are much lower. Groundwater flow in the vicinity of Site 11 is toward the Seaplane Lagoon in a northwesterly direction (Figure 1.2-2).

Nine metals were detected in one or more groundwater samples from the five Site 11 and 21 monitoring wells analyzed for metals during Quarter 2. Detected concentrations of antimony (in one well), arsenic (in three wells and one duplicate), barium (in all five wells and one duplicate), cadmium (in one well), chromium (in two wells), manganese (in three wells and one duplicate), molybdenum (in three wells and one duplicate), nickel (in two wells), and zinc (in one well) are shown in Table 4.9-2.

All five Site 11 and Site 21 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.9-3.

#### 4.9.4

#### Quarter 3 Analytical Results

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from two Site 11 monitoring wells (M11-02 and M11-06, screened in the FWBZ) during Quarter 3 sampling, as shown on Figure 4.1-1, Sheet 3. Inorganic constituents exceeded the MCLs during Quarter 3 sampling in four Site 11 wells (M11-01, M11-02, M11-05, and M11-06) but not the Site 21



well; these wells are screened in the FWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 3. No organic or inorganic compounds exceeded the MCLs in the Site 21 monitoring well M07B-01.

Organic analytical results for compounds detected in groundwater samples collected at Sites 11 and 21, during Quarter 3, are presented in Table 4.9-1. VOCs were detected in four wells. TCE was detected in three wells and one duplicate sample at concentrations ranging from 3 to 11  $\mu\text{g/L}$ . Vinyl chloride was detected in well M11-06 and its duplicate sample at a concentration of 1  $\mu\text{g/L}$ . In addition, 1,1,1-DCA, cis-1,2-DCE, and trans-1,2-DCE were detected in the Site 11 wells. Compared to the concentrations detected in samples from nearby Site 4, concentrations of organic contaminants in groundwater at Sites 11 and 21 are much lower. Groundwater flow in the vicinity of Site 11 is toward the Seaplane Lagoon in a northwesterly direction (Figure 1.2-2).

Eleven metals were detected in one or more groundwater samples from the five Site 11 and 21 monitoring wells analyzed for metals during Quarter 3. Detected concentrations of arsenic (in three wells), barium (in all five wells and one duplicate), cadmium (in one well), chromium (in four wells and one duplicate), cobalt (in two wells), copper (in one well), manganese (in all five wells and one duplicate), molybdenum (in all five wells and one duplicate), nickel (in all five wells and one duplicate), vanadium (in one well), and zinc (in all five wells, but not the duplicate) are shown in Table 4.9-2.

All five Sites 11 and 21 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.9-3.

#### **4.9.5 Quarter 4 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from three Site 11 monitoring wells (M11-01, M11-02, and M11-06, screened in the FWBZ) during Quarter 4, as shown on Figure 4.1-1, Sheet 4. No organic or compounds exceeded the MCLs in the Site 21 monitoring well M07B-01. Inorganic constituents exceeded the MCLs during Quarter 4 sampling in four Site 11 and 21 wells including three Site 11 wells (M11-01, M11-05, and M11-06) and one Site 21 well (M07B-01); these wells are screened in the FWBZ. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 4.

Organic analytical results for compounds detected in groundwater samples collected at Sites 11 and 21, during Quarter 4, are presented in Table 4.9-1. VOCs were detected in four wells. TCE was detected in three wells (M11-01, M11-02, and M11-06) and one duplicate sample at concentrations ranging from 1 to 11  $\mu\text{g/L}$ . Vinyl chloride was detected in well M11-01 and the duplicate sample from M11-06 at concentrations of 0.7 and 2  $\mu\text{g/L}$ , respectively. In addition, 1,1,1-DCA, cis-1,2-DCE, and trans-1,2-DCE were detected in the Site 11 wells and PCE was detected in the Site 21 well. Compared to the concentrations detected in samples from nearby Site 4, concentrations of organic contaminants in groundwater at Sites 11 and 21 are much lower. Groundwater flow in the vicinity of Site 11 is toward the Seaplane Lagoon in a northwesterly direction (Figure 1.2-2).

Ten metals were detected in one or more groundwater samples from the five Site 11 and 21 monitoring wells analyzed for metals during Quarter 4. Detected concentrations of arsenic (in one well), barium (in all five wells and one duplicate), cadmium (in one well and one duplicate), chromium (in one well and one duplicate), cobalt (in two wells), lead (in one duplicate), manganese (in all five wells and one duplicate), molybdenum (in all five wells and one duplicate), vanadium (in three wells and one duplicate), and zinc (in three wells) are shown in Table 4.9-2.

All five Sites 11 and 21 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.9-3.

#### **4.9.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Sites 11 and 21, changes in chemical type and concentration were followed over a period from 1994 through 1998. Time-series plots were prepared for four monitoring wells at Sites 11 and 21, located within and adjacent to the groundwater contaminant plumes depicted in Figures 6-5 and 6-6. The time-series plots present a more diverse group of chemicals than the three representative chemicals shown in the contaminant plumes in Figures 6-5 and 6-6. Figures 4.9-1 through 4.9-4 depict time-series plots for an east to west transect of monitoring wells (M11-02, M11-01, M11-06, and M07B-01) associated with a chlorinated solvent and petroleum plume. Only monitoring well M11-01 is located within the very small co-mingled solvent and petroleum plume. Both plumes appear to be stable, degrading slowly over time. No substantial increases in the concentration of parent compounds were observed. There is no correlation

between changes in chemical concentrations within either plume and precipitation events or seasonal groundwater fluctuations.

In monitoring wells M11-02 and M11-01, the concentrations of chlorinated solvents and petroleum compounds have generally decreased over the four year time frame. In well M11-02, the concentration of the parent chemical (TCE) has increased, while the concentrations of the degradation products (DCE, DCA, TCA, and vinyl chloride) have decreased slightly. In well M11-01, the concentrations of the parent chemical (TCE) and a degradation product (vinyl chloride) have increased slightly, while the concentrations of the degradation products (DCA and TCA) and benzene have decreased to chemical reporting limits. The increase in TCE and vinyl chloride may be related to the migration of chlorinated solvents from an up gradient source at Site 4.

In monitoring wells M11-06 and M07B-01, the concentrations of chlorinated solvents have decreased over the four year time frame. In well M11-06, the concentrations of both the parent chemical (TCE) and degradation products (DCA, DCE, and vinyl chloride) have decreased; while in well M07B-01, the concentrations of the parent chemicals (PCE) and degradation products (TCA, DCA, DCE, and vinyl chloride) have decreased to chemical reporting limits. However, in the summer of 1998, the parent chemical PCE was detected at low levels in well M07B-01.

TABLE 4.9-1  
SITES 11 AND 21  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M07B-01	108-S21-001	11/05/97	1,1-DICHLOROETHANE: 1 VINYL CHLORIDE: 0.8	NA	NA	NA	NA
M11-01	108-S11-003	11/05/97	ACETONE: R	NA	NA	NA	NA
M11-02	108-S11-004	11/05/97	1,1-DICHLOROETHANE: 2J ACETONE: R VINYL CHLORIDE: 1J	NA	NA	NA	NA
M11-02	108-S11-005*	11/05/97	1,1-DICHLOROETHANE: 2J ACETONE: R	NA	NA	NA	NA
M11-05	108-S11-001	11/05/97	ACETONE: R	NA	NA	NA	NA
M11-06	108-S11-002	11/05/97	ACETONE: R VINYL CHLORIDE: 2	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
\* = Duplicate sample

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.9-1  
SITES 11 AND 21  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLEATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M11-01	108-S11-006	02/06/98	2-BUTANONE: R ACETONE: R TRICHLOROETHENE: 2 VINYL CHLORIDE: 0.6	NA	NA	NA	NA
M11-02	108-S11-007	02/09/98	1,1,1-TRICHLOROETHANE: 2 1,1-DICHLOROETHANE: 4 2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 3 TRICHLOROETHENE: 12	NA	NA	NA	NA
M11-05	108-S11-008	02/06/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M11-05	108-S11-009	02/06/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M11-06	108-S11-010	02/06/98	2-BUTANONE: R ACETONE: R TRICHLOROETHENE: 2 VINYL CHLORIDE: 0.9	NA	NA	NA	NA
M07B-01	108-S21-002	02/13/98	2-BUTANONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.9-1  
SITES 11 AND 21  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M11-01	108-S11-011	05/12/98	2-BUTANONE: R ACETONE: R TRICHLOROETHENE: 3	NA	NA	NA	NA
M11-02	108-S11-012	05/12/98	1,1-DICHLOROETHANE: 2 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 3 TRANS-1,2-DICHLOROETHENE: 2 TRICHLOROETHENE: 11	NA	NA	NA	NA
M11-05	108-S11-013	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M11-06	108-S11-014	05/12/98	2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 1 TRICHLOROETHENE: 3 VINYL CHLORIDE: 1	NA	NA	NA	NA
M11-06	108-S11-015	05/12/98	1,1-DICHLOROETHANE: 1 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 1 TRICHLOROETHENE: 3 VINYL CHLORIDE: 1	NA	NA	NA	NA
M07B-01	108-S21-003	05/13/98	2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 2	NA	NA	NA	NA

Notes:  
 µg/L = Micrograms per liter  
 mg/L = Milligrams per liter  
 NA = Not analyzed  
 \* Field duplicate samples: 108-S11-014 / 108-S11-015

PCBs = Polychlorinated biphenyls  
 J = Value estimated at reported concentration  
 R = Rejected

TABLE 4.9-1  
SITES 11 AND 21  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M11-01	108-S11-016	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R TRICHLOROETHENE: 1J VINYL CHLORIDE: 0.7J	NA	NA	NA	NA
M11-02	108-S11-017	08/07/98	1,1-DICHLOROETHANE: 2J 2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 3J TRANS-1,2-DICHLOROETHENE: 1J TRICHLOROETHENE: 11J	NA	NA	NA	NA
M11-05	108-S11-018	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA
M11-06	108-S11-019	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 1J TRICHLOROETHENE: 3J	NA	NA	NA	NA
M11-06	108-S11-020	08/07/98	1,1-DICHLOROETHANE: 1J 2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 1J TRICHLOROETHENE: 3J VINYL CHLORIDE: 2J	NA	NA	NA	NA
M07B-01	108-S21-004	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R TETRACHLOROETHENE: 2J	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected



TABLE 4.9-2  
SITES 11 AND 21  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
M07B-01	108-S21-001	11/05/97	<0.76	15.1	217	<0.15	<0.15	<0.92	<0.40	<0.65	<0.65	263	<0.10	4.2J	2.0J	<1.0	<0.54	<1.2	7.2J	<9.4
M11-01	108-S11-003	11/05/97	<0.65	<3.8	150	<0.15	<0.26	<1.0	0.58J	<0.65	<0.65	455	<0.10	<1.3	4.7J	<1.0	<0.42	<1.2	<1.5	<7.5
M11-02	108-S11-004	11/05/97	<1.5	<1.8	115	<0.15	<0.40	<1.3	<0.40	<0.65	<0.94	373	<0.10	<1.2	38.0	1.3J	<0.45	<1.2	<1.8	12.4
M11-02	108-S11-005*	11/05/97	<0.65	<1.7	108	<0.15	0.38J	<1.5	0.59J	0.80J	<0.88	359	<0.10	<1.1	36.0	<1.0	<0.45	<1.2	<1.3	19.3
M11-05	108-S11-001	11/05/97	<0.65	7.9	422	<0.15	<0.23	<0.88	<0.40	<0.65	<0.65	1420	<0.10	3.5J	<1.7	1.1J	<0.67	<1.2	<1.0	<8.2
M11-06	108-S11-002	11/05/97	<0.80	<4.0	43.1J	<0.15	<0.15	3.4J	<0.40	1.2J	<0.65	86.7	<0.10	<2.2	2.4J	1.4J	<0.44	<1.2	12.8J	<9.7

Notes:

$\mu\text{g/L}$  = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
\* = Duplicate sample

TABLE 4.9-2  
SITES 11 AND 21  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M11-01	108-S11-006	02/06/98	<1.4	1.7J	102	<0.10	<0.20	<0.48	<2.1	<0.35	<0.60	716	<0.10	1.2J	8.5	<0.80	<0.15	<1.4	<0.49	<3.0
M11-02	108-S11-007	02/09/98	<0.70	<0.80	49.6J	<0.10	1.1J	<0.42	<0.25	<2.0	<0.60	<0.86	<0.10	<1.8	5.0J	<0.80	<0.15	<1.3	<0.76	10.3
M11-05	108-S11-008	02/06/98	<0.70	3.0J	97.3J	<0.10	<0.20	<0.80	<0.28	<0.35	<0.60	278	<0.10	3.5J	<3.1	<0.80	<0.15	<1.4	<2.8	<4.1
M11-05	108-S11-009	02/06/98	<1.0	3.7J	93.2J	<0.10	<0.20	<0.53	<0.47	<0.35	<0.60	274	<0.10	3.6J	<2.7	<0.80	<0.15	<1.4	<2.5	<3.4
M11-06	108-S11-010	02/06/98	<0.70	1.5J	55.3J	<0.10	<0.20	1.8J	<0.25	<0.35	<0.60	22.5	<0.10	2.6J	<1.1	<0.80	<0.15	<1.4	<3.9	<7.8
M07B-01	108-S21-002	02/13/98	1.0J	<6.1	30.7J	<0.10	<0.20	0.55J	<0.25	<0.35	<0.60	<1.5	<0.10	<2.2	<1.1	<0.90	<0.15	<1.4	<5.9	<3.2

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.9-2  
SITES 11 AND 21  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M11-01	108-S11-011	05/12/98	<0.85	<1.0	374	<0.10	<0.22	0.40J	1.5J	<2.6	<0.50	694	<0.10	1.4J	8.4	<0.85	<0.30	<1.4	<1.1	99.5
M11-02	108-S11-012	05/12/98	<0.85	<1.0	306	<0.10	0.78J	<0.35	0.40J	12.2J	<0.50	69.4	<0.10	2.8J	26.7	<0.85	<0.30	<1.4	<1.4	106
M11-05	108-S11-013	05/12/98	<0.85	4.3J	346	<0.10	<0.15	1.2J	<0.30	<2.1	<0.50	414	<0.10	3.2J	3.6J	<0.85	<0.30	<1.4	<1.8	104
M11-06	108-S11-014	05/12/98	<0.85	1.1J	292	<0.10	<0.40	1.8J	<0.30	<2.9	<6.9	78.6	<0.10	2.9J	1.8J	<0.85	<0.30	<1.4	<3.3	93.4
M11-06	108-S11-015	05/12/98	<0.85	<1.0	101	<0.10	<0.20	1.4J	<0.30	<2.0	<4.2	54.2	<0.10	2.8J	1.0J	<0.85	<0.30	<1.4	<2.9	<14.8
M07B-01	108-S21-003	05/13/98	<0.85	3.7J	300	<0.10	<0.15	1.2J	<0.30	<2.8	<0.50	9.9	<0.10	2.1J	1.5J	R	<0.30	<1.4	5.3J	88.1

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 \* Field duplicate samples: 108-S11-014 / 108-S11-015

< = Parameter reported below reporting limit

TABLE 4.9-2  
SITES 11 AND 21  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M11-01	108-S11-016	08/07/98	<1.8	<5.8	152J	<0.20	<0.30	<0.80	3.0J	<2.8	<1.7	713	<0.10	1.6J	<7.6	<2.2	<0.70	<1.1	<0.60	9.0J
M11-02	108-S11-017	08/07/98	<2.6	<2.1	83.6J	<0.20	<0.30	<0.80	<2.0	<9.1	<1.7	26.6	<0.10	3.4J	<19.4	<2.2	<0.70	<1.1	2.2J	11.4J
M11-05	108-S11-018	08/07/98	<4.4	<9.3	202	<0.20	<0.30	<0.80	<2.2	<2.7	<1.7	789	<0.10	2.9J	<1.8	<2.2	<0.70	<1.1	<0.60	<6.1
M11-06	108-S11-019	08/07/98	<2.7	<4.0	70.2J	<0.20	<0.30	1.2J	<2.5	<4.3	<1.7	103	<0.10	2.8J	<1.3	<2.2	<0.70	<1.1	4.2J	7.8J
M11-06	108-S11-020	08/07/98	<2.0	<2.9	59.8J	<0.20	1.7J	0.98J	<0.40	<3.5	8.3	77.7	<0.10	3.0J	<1.4	<2.2	<0.70	<1.1	3.5J	<3.9
M07B-01	108-S21-004	08/07/98	<2.7	14.1	77.9J	<0.20	0.36J	<0.80	4.1J	<2.4	<1.7	77.6	<0.10	5.4	<1.5	<2.2	<0.70	<1.1	7.2J	<1.9

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.9-3  
SITES 11 AND 21  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 2)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M07B-01	108-S21-001	11/05/97	Alkalinity: 474 Bicarbonate: 474	Bromide: 1.8 Chloride: 433 Fluoride: 1.0 Phosphate: 3.0 Sulfate: 52.5	Total Dissolved Solids: 1200	ND	TOC Test 2: 3
M11-01	108-S11-003	11/05/97	Alkalinity: 610 Bicarbonate: 610	Bromide: 1.8 Chloride: 257 Fluoride: 1.3 Phosphate: 2.8 Sulfate: 4.9	Total Dissolved Solids: 1000	ND	TOC Test 2: 12 Total Organic Carbon: 13
M11-02	108-S11-004	11/05/97	Alkalinity: 722 Bicarbonate: 722	Bromide: 2.1 Chloride: 206 Fluoride: 1.0 Phosphate: 3.5 Sulfate: 36.4	Total Dissolved Solids: 1400	ND	TOC Test 2: 11 Total Organic Carbon: 11
M11-02	108-S11-005	11/05/97	ND	Bromide: 1.8 Chloride: 153 Fluoride: 1.1 Phosphate: 2.7 Sulfate: 33.4	NA	NA	NA
M11-05	108-S11-001	11/05/97	Alkalinity: 391 Bicarbonate: 391	Bromide: 9.9 Chloride: 1880 Phosphate: 2.9 Sulfate: 263	Total Dissolved Solids: 4800	ND	TOC Test 2: 23 Total Organic Carbon: 23

TABLE 4.9-3  
SITES 11 AND 21  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 2 of 2)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M11-06	108-S11-002	11/05/97	Alkalinity: 521 Bicarbonate: 521	Bromide: 0.79 Chloride: 166 Fluoride: 1.1 Phosphate: 11.9 Sulfate: 3.3	Total Dissolved Solids: 890	ND	TOC Test 2: 7 Total Organic Carbon: 8

Notes:

mg/L = Milligrams per liter

NA = Not analyzed

ND = Not detected

TABLE 4.9-3  
SITE 11 AND 21  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
M11-01	108-S11-006	02/06/98	Alkalinity: 643 Bicarbonate: 643	Bromide: 1 Chloride: 139 Fluoride: 0.54 Nitrate: 0.34 Phosphate: 1.3 Sulfate: 35.2	Total Dissolved Solids: 890
M11-02	108-S11-007	02/09/98	Alkalinity: 372 Bicarbonate: 372	Bromide: 0.14 Chloride: 9.5 Fluoride: 0.35 Nitrate: 0.61 Nitrite: 0.11 Sulfate: 48.6	Total Dissolved Solids: 480
M11-05	108-S11-008	02/06/98	Alkalinity: 276 Bicarbonate: 276	Bromide: 3.1 Chloride: 643 Fluoride: 0.31 Nitrate: 1.2 Phosphate: 2.5 Sulfate: 82.5	Total Dissolved Solids: 1200
M11-06	108-S11-010	02/06/98	Alkalinity: 231 Bicarbonate: 231	Bromide: 0.26 Chloride: 48.2 Fluoride: 0.42 Nitrate: 1.3 Nitrite: 0.13 Phosphate: 1.2 Sulfate: 43.8	Total Dissolved Solids: 300
M07B-01	108-S21-002	02/13/98	Alkalinity: 101 Bicarbonate: 101	Chloride: 8.15 Fluoride: 0.45 Nitrate: 0.2 Phosphate: 0.54 Sulfate: 8.8	Total Dissolved Solids: 190

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration



TABLE 4.9-3  
SITES 11 AND 21  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M07B-01	108-S21-003	05/13/98	Alkalinity: 139 Bicarbonate: 139	Chloride: 11.5 Fluoride: 0.38 J Nitrate-N: 0.33 Phosphate: 0.32 J Sulfate: 10.1 J	Total Dissolved Solids: 420	Total Sulfide: 1.0 J	NA
M11-01	108-S11-011	05/12/98	Alkalinity: 560 Bicarbonate: 560	Bromide: R Chloride: 94.4 Nitrate-N: 0.21 Sulfate: 22.9	Total Dissolved Solids: 1100	Total Sulfide: 7.4 J	NA
M11-02	108-S11-012	05/12/98	Alkalinity: 437 Bicarbonate: 437	Bromide: R Chloride: 13.4 Fluoride: 0.54 J Sulfate: 57.3	Total Dissolved Solids: 800	Total Sulfide: 7.4 J	NA
M11-05	108-S11-013	05/12/98	Alkalinity: 298 Bicarbonate: 298	Bromide: R Chloride: 1030 Phosphate: 4 J Sulfate: 49.4	Total Dissolved Solids: 2500	Total Sulfide: 7.0 J	NA
M11-06	108-S11-014	05/12/98	Alkalinity: 213 Bicarbonate: 213	Bromide: R Chloride: 67.8 Fluoride: 0.72 J Nitrate-N: 0.38 Phosphate: 1.9 J Sulfate: 23.1	Total Dissolved Solids: 560	ND	NA

Notes:

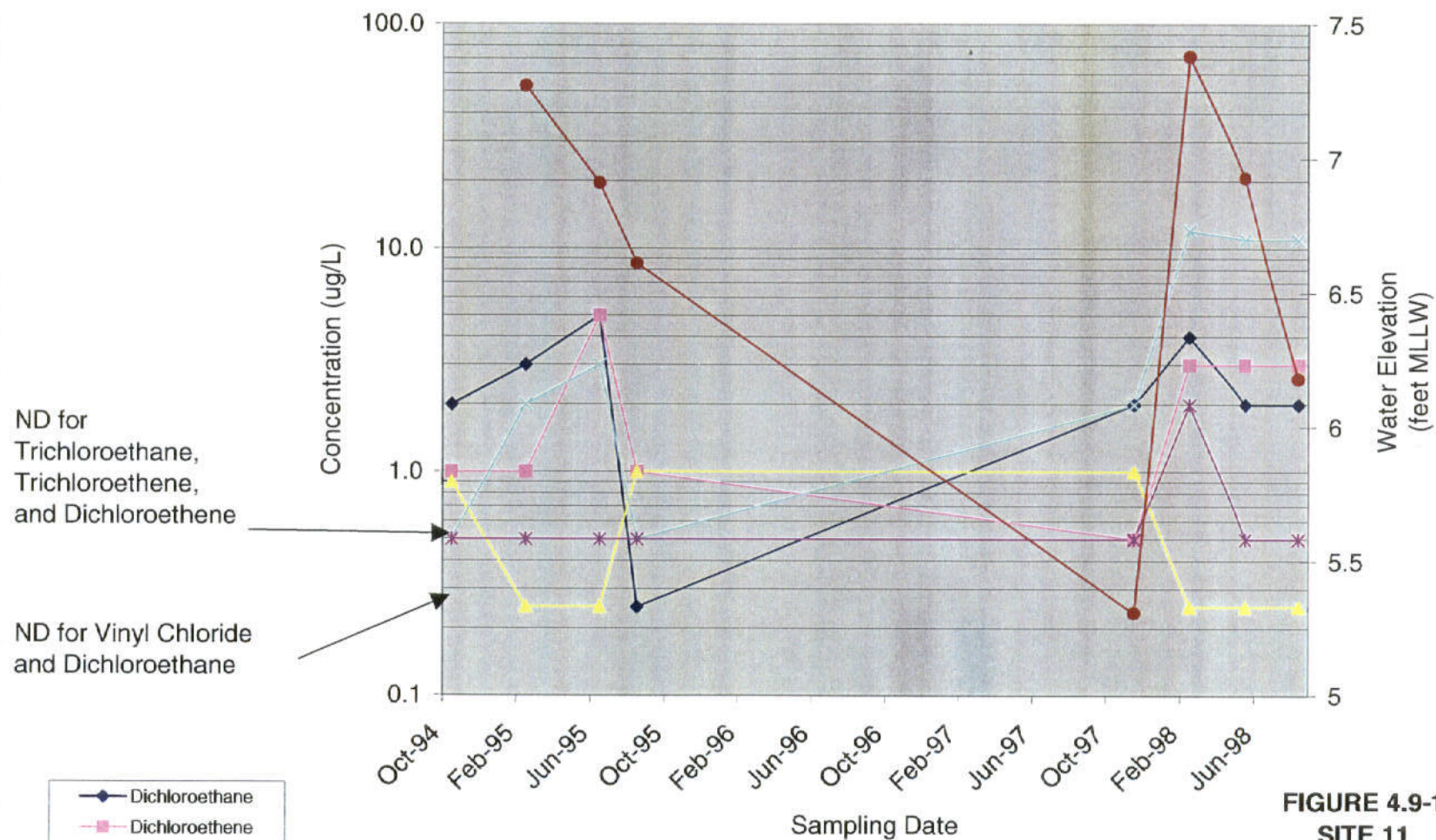
J = Value estimated at reported concentration      NA = Not analyzed  
mg/L = Milligrams per liter      ND = Not detected  
R = Rejected

TABLE 4.9-3  
SITES 11 AND 21  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M07B-01	108-S21-004	08/07/98	Alkalinity: 329 Bicarbonate: 329	Bromide: 0.66 Chloride: 122 Phosphate: 2.3 Sulfate: 22.7	Total Dissolved Solids: 600	Total Sulfide: 1.0	NA
M11-01	108-S11-016	08/07/98	Alkalinity: 659 Bicarbonate: 659	Bromide: 1.6 Chloride: 170 Phosphate: 0.94 Sulfate: 9.4	Total Dissolved Solids: 1100	ND	NA
M11-02	108-S11-017	08/07/98	Alkalinity: 512 Bicarbonate: 512	Bromide: 0.67 Chloride: 20.5 Nitrate-N: 0.70 Sulfate: 78.9	Total Dissolved Solids: 760	ND	NA
M11-05	108-S11-018	08/07/98	Alkalinity: 326 Bicarbonate: 326	Bromide: 6.8 Chloride: 1550 Sulfate: 131	Total Dissolved Solids: 3400	ND	NA
M11-06	108-S11-019	08/07/98	Alkalinity: 318 Bicarbonate: 318	Bromide: 0.61 Chloride: 108 Phosphate: 2.7 Sulfate: 18.8	Total Dissolved Solids: 610	Total Sulfide: 1.5	NA

Notes:

mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected



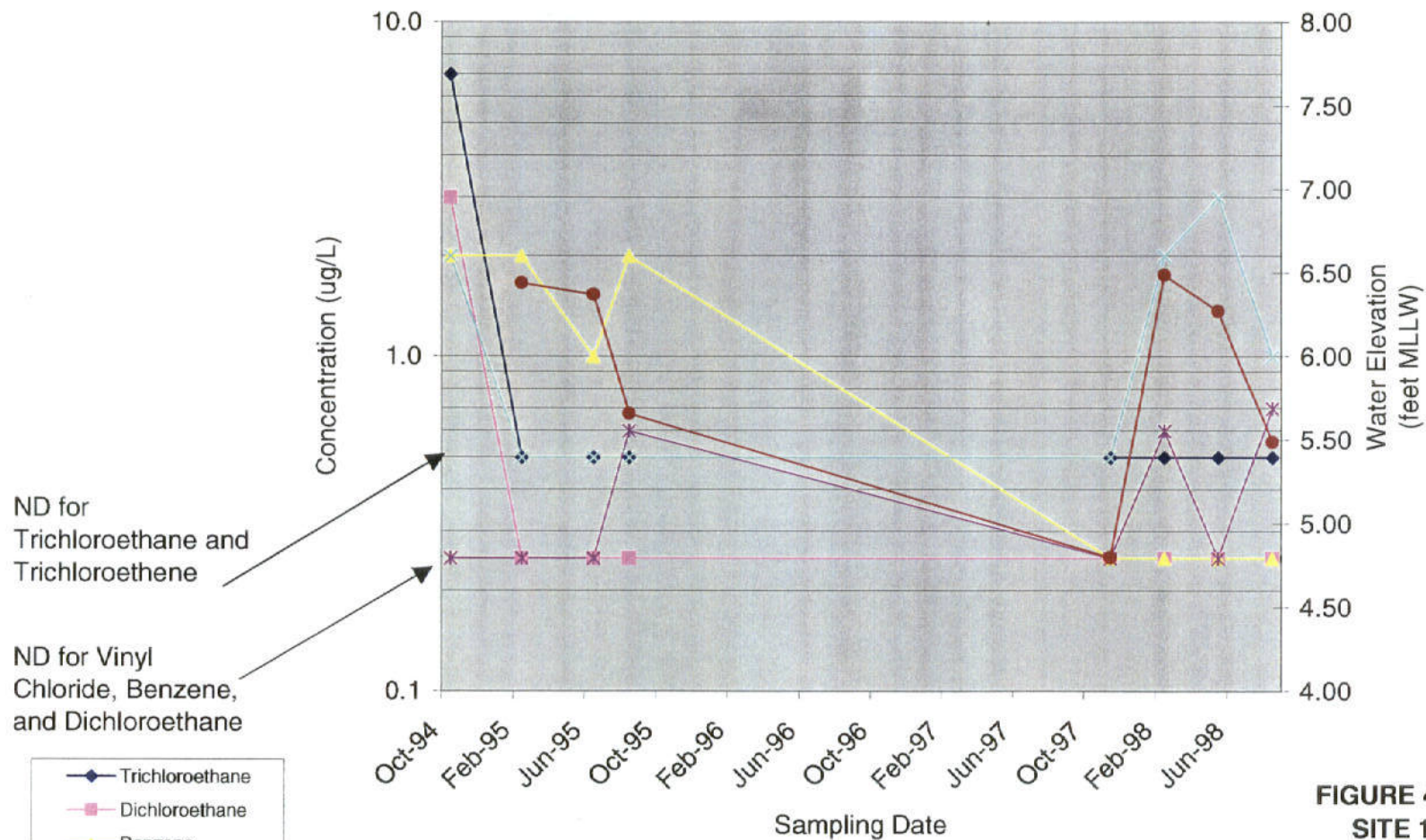
**NOTES:**

ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.

ug/L - Micrograms per liter.

MLLW - Feet above mean lower low water.

**FIGURE 4.9-1**  
**SITE 11**  
**MONITORING WELL M11-02**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

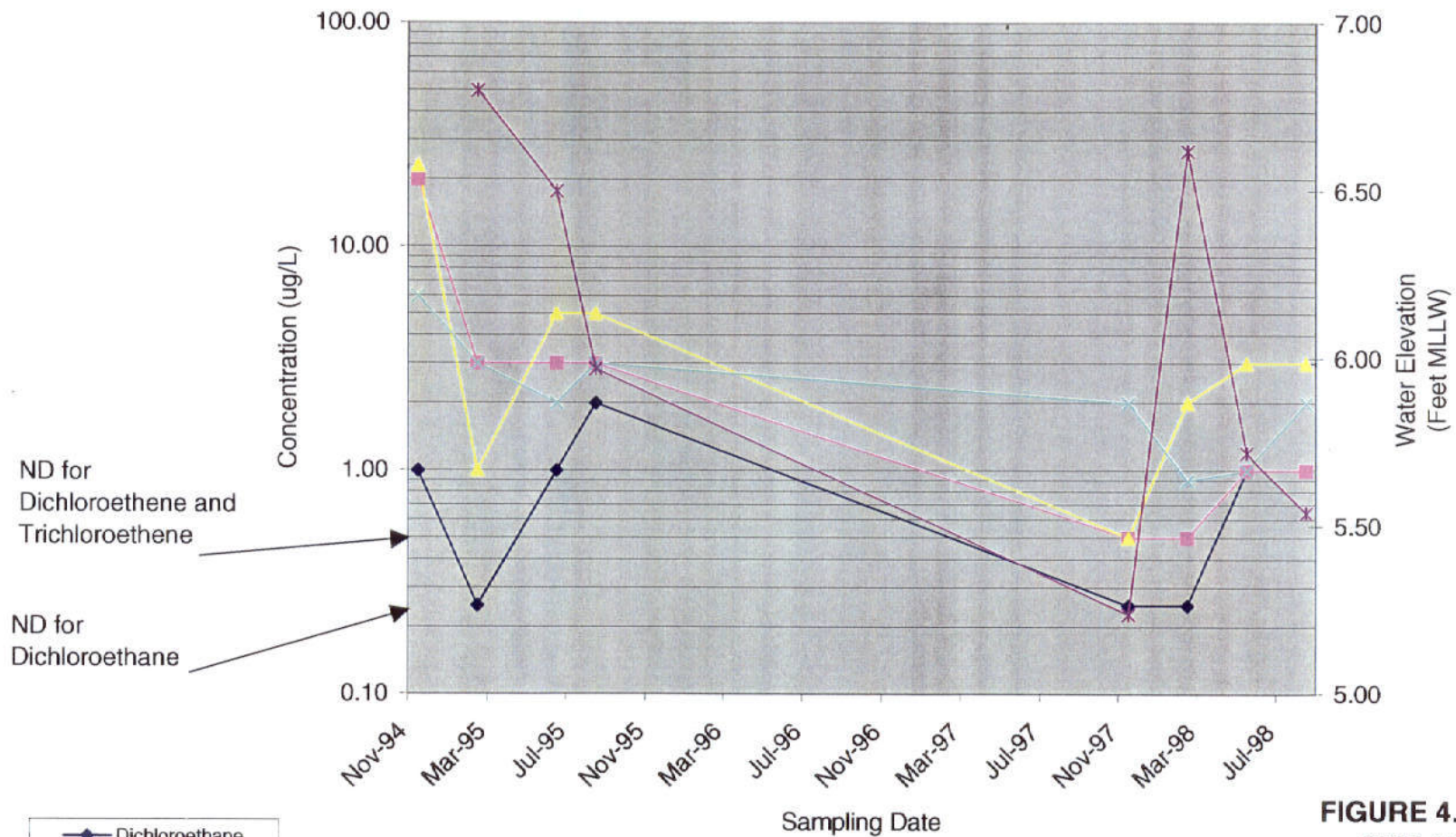


**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.9-2**  
**SITE 11**  
**MONITORING WELL M11-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

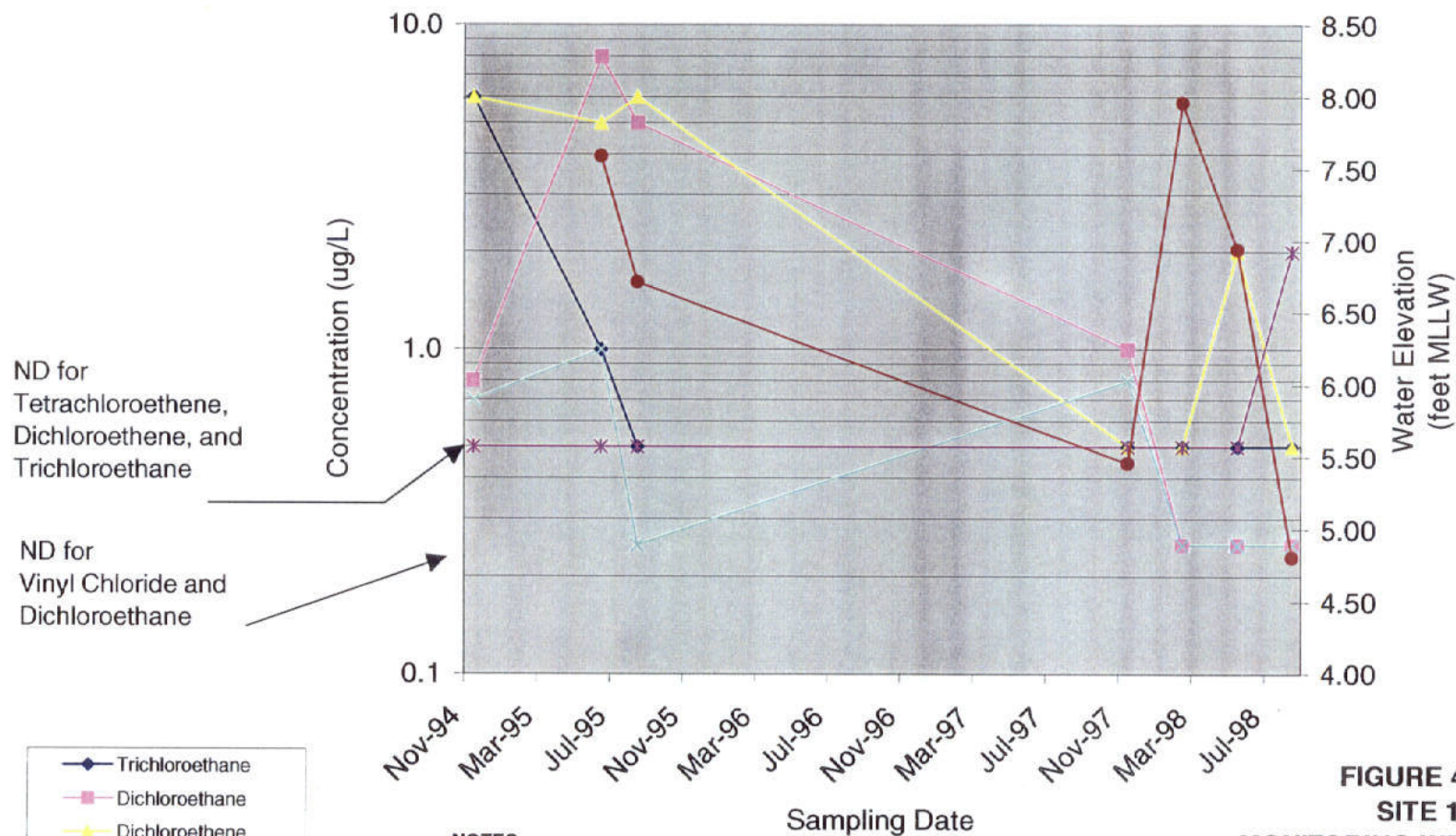




**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.9-3**  
**SITE 11**  
**MONITORING WELL M11-06**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



**NOTES:**

ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.

ug/L - Micrograms per liter.

MLLW - Feet above mean lower low water.

**FIGURE 4.9-4**  
**SITE 11**  
**MONITORING WELL M07B-01**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

#### **4.10 SITE 12 – BUILDING 10, POWER PLANT**

Site 12 is located north of the Seaplane Lagoon, near Site 5 (Figure 1.2-2). Building 10, located on the site, serves as a power plant. Nine aboveground diesel tanks, located on the south side of the building, provide backup fuel for the boilers. Five USTs were also located along the northeast side of the building. Fuel oil spills have been reported at the site (PRC and Montgomery Watson 1993c).

Currently, there are five groundwater monitoring wells at Site 12; one was selected for quarterly sampling. During prior sampling of Site 12 wells, solvents associated with nearby Site 5 were detected in groundwater. Despite fuel oil spills in the vicinity of Site 12 and engine maintenance activities to the north, petroleum hydrocarbons were not detected in prior groundwater samples from these wells.

Table 4.0-1 lists the one groundwater well that was sampled at Site 12 and identifies the parameters for which the samples were analyzed, by quarter. The location of this well is shown on Figure 1.2-3.

##### **4.10.1 Sampling Plan Rationale**

Well M12-01 is screened in the FWBZ and is near the margin of the solvent plume originating at Site 5. Samples from this well were analyzed for VOCs. The VOC data were collected to monitor solvent concentrations associated with Site 5.

Samples from this well were also analyzed for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of beneficial uses of groundwater at Alameda Point. The metals data were also collected to assess potential impacts from boiler blowdown water released from Building 10 near well M12-01.

Samples from this well were analyzed for TOC during the first quarterly sampling event. The TOC data were collected to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential. Sections 4.10.2 through 4.10.5 present the analytical results for each quarter of sampling.

#### **4.10.2 Quarter 1 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the monitoring well M12-01, screened in the FWBZ, during Quarter 1 sampling. Similarly, inorganic constituents did not exceed the MCLs in groundwater from this well during Quarter 1 sampling.

Table 4.10-1 presents the organic compounds detected in groundwater from the well sampled at Site 12 during Quarter 1. PCE was detected at a concentration of 1  $\mu\text{g/L}$  in the groundwater from well M12-01. Groundwater flow in the FWBZ in the vicinity of Site 12 is toward the northwest and toward Site 5 (Figure 1.2-2).

Table 4.10-2 presents the inorganic constituents detected in groundwater from the Site 12 well. Two metals, barium and manganese, were detected during Quarter 1 sampling at concentrations of 109  $\mu\text{g/L}$  and 7.0  $\mu\text{g/L}$ , respectively.

Well M12-01 was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. This well was analyzed for TOC during the first quarter of sampling. The results are presented on Table 4.10-3.

#### **4.10.3 Quarter 2 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the Site 12 monitoring well M12-01, screened in the FWBZ, during Quarter 2 sampling. Similarly, inorganic constituents did not exceed the MCLs in groundwater from this well during Quarter 2.

Table 4.10-1 presents the organic compounds detected in groundwater from the well sampled at Site 12 during Quarter 2. PCE was detected at a concentration of 2  $\mu\text{g/L}$  in the groundwater from well M12-01. Groundwater flow in the FWBZ in the vicinity of Site 12 is toward the northwest and toward Site 5 (Figure 1.2-2).

Table 4.10-2 presents the inorganic constituents detected in groundwater from the Site 12 well. Five metals (barium, cadmium, manganese, molybdenum, and nickel) were detected in groundwater from the Site 12 well during Quarter 2 sampling.



Well M12-01 was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.10-3.

#### **4.10.4 Quarter 3 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the Site 12 monitoring well M12-01, screened in the FWBZ, during Quarter 3 sampling. One or more inorganic constituents exceeded the MCLs in groundwater from this well during Quarter 3, as shown on Figure 4.1-3, Sheet 3.

Table 4.10-1 presents the organic compounds detected in groundwater from the well sampled at Site 12 during Quarter 3. PCE was detected at a concentration of 2  $\mu\text{g/L}$  in the groundwater from well M12-01. Groundwater flow in the FWBZ in the vicinity of Site 12 is toward the northwest and toward Site 5 (Figure 1.2-2).

Table 4.10-2 presents the inorganic constituents detected in groundwater from the Site 12 well. Seven metals (arsenic, barium, chromium, manganese, molybdenum, nickel, and zinc) were detected in groundwater from the Site 12 well during Quarter 3 sampling.

Well M12-01 was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.10-3.

#### **4.10.5 Quarter 4 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from the Site 12 monitoring well M12-01, screened in the FWBZ, during Quarter 4 sampling, as shown on Figure 4.1-1, Sheet 4. One or more inorganic constituents also exceeded the MCLs in groundwater from this well during Quarter 4, as shown on Figure 4.1-3, Sheet 4.

Table 4.10-1 presents the organic compounds detected in groundwater from the well sampled at Site 12 during Quarter 4. Vinyl chloride was detected at a concentration of 1  $\mu\text{g/L}$  and cis-1,2-DCE was detected at a concentration of 6  $\mu\text{g/L}$  in the groundwater from well M12-01. Groundwater flow in the FWBZ in the vicinity of Site 12 is toward the northwest and toward Site 5 (Figure 1.2-2).

Table 4.10-2 presents the inorganic constituents detected in groundwater from the Site 12 well. Seven metals (barium, cobalt, lead, manganese, molybdenum, vanadium, and zinc) were detected in groundwater from the Site 12 well during Quarter 4 sampling.

Well M12-01 was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.10-3.

TABLE 4.10-1  
SITE 12  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M12-01	108-S12-001	11/06/97	2-BUTANONE: R ACETONE: R TETRACHLOROETHENE: 1J	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	R = Rejected

TABLE 4.10-1  
SITE 12  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M12-01	108-S12-002	02/09/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R TETRACHLOROETHENE: 2	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.10-1  
SITE 12  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
ML2-01	108-S12-003	05/12/98	2-BUTANONE: R ACETONE: R TETRACHLOROETHENE: 2	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	R = Rejected

TABLE 4.10-1  
SITE 12  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
ML2-01	108-S12-004	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 6J VINYL CHLORIDE: 1J	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.10-2  
SITE 12  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
M12-01	108-S12-001	11/06/97	<1.1	<1.0	109	<0.15	<0.15	<0.30	<0.40	<0.65	<0.65	7.0J	<0.10	<3.4	<5.8	<1.0	<0.35	<0.90	<1.7	<8.4

Notes:  
 $\mu\text{g/L}$  = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit



TABLE 4.10-2  
SITE 12  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M12-01	108-S12-002	02/09/98	<2.2	<2.7	104	<0.10	0.25J	<1.2	<0.31	<2.4	<0.60	45.1	<0.10	8.6	5.3J	<1.4	<0.15	<1.3	<2.5	<4.2

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.10-2  
SITE 12  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M12-01	108-S12-003	05/12/98	<0.85	1.6J	354	<0.10	<0.15	2.2J	<0.30	<4.5	<0.50	11.4	<0.10	7.4	7.4J	<2.0	<0.30	<1.4	<3.7	95.9

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit

TABLE 4.10-2  
SITE 12  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
M12-01	108-S12-004	08/07/98	<3.0	<2.5	98.3J	<0.20	<0.30	<0.80	2.7J	<3.8	2.1J	64.4	<0.10	11.2	<5.4	<2.2	<0.70	<1.1	4.2J	12.2J

Notes:

$\mu\text{g/L}$  = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.10-3  
SITE 12  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M12-01	108-S12-001	11/06/97	Alkalinity: 355 Bicarbonate: 355	Bromide: 0.35 Chloride: 69.1 Fluoride: 0.72 Nitrate-N: 0.23 Phosphate: 0.10 Sulfate: 64.5	Total Dissolved Solids: 480	ND	TOC Test 2: 4

Notes:

mg/L = Milligrams per liter  
ND = Not detected

TABLE 4.10-3  
SITE 12  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
M12-01	108-S12-002	02/09/98	Alkalinity: 444 Bicarbonate: 444	Bromide: 0.18 Chloride: 94.8 Fluoride: 1.2 Nitrate: 1.7 Phosphate: 0.62 Sulfate: 57.8	Total Dissolved Solids: 660

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration

TABLE 4.10-3  
 SITE 12  
 QUARTER 3  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 (Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M12-01	108-S12-003	05/12/98	Alkalinity: 437 Bicarbonate: 437	Bromide: R Chloride: 76.9 Fluoride: 1.4 J Nitrate-N: 2.9 Sulfate: 65	Total Dissolved Solids: 900	Total Sulfide: 7.4 J	NA

Notes:

J = Value estimated at reported concentration  
 mg/L = Milligrams per liter  
 NA = Not analyzed  
 R = Rejected

TABLE 4.10-3  
 SITE 12  
 QUARTER 4  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 (Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M12-01	108-S12-004	08/07/98	Alkalinity: 493 Bicarbonate: 493	Chloride: 67.6 Fluoride: 1.1 Nitrate-N: 1.4 Sulfate: 50.3	Total Dissolved Solids: 860	Total Sulfide: 1.0	NA

Notes:

mg/L = Milligrams per liter

NA = Not analyzed



#### 4.11

#### **SITE 13 – FORMER OIL REFINERY AND SITE 19 – HAZARDOUS WASTE STORAGE AREA**

Sites 13 and 19 are located in the southeast portion of Alameda Point (Figure 1.2-2). Site 13 occupies approximately 30 acres and was operated as a refinery from 1879 to 1903. Refinery wastes and asphaltic residues were dumped at the site during this period. During prior environmental investigations, a layer of black, tar-like material was encountered in two soil borings drilled at the site. The site is largely an empty lot at this time (PRC and Montgomery Watson 1993c). Sites 19, 22, and 23 are located within the Site 13 boundary. Groundwater results from Site 19, a hazardous waste storage area, will be discussed in the following sections along with Site 13. Sites 22 and 23 will be discussed in Sections 4.14 and 4.15, respectively.

Currently, there are 10 groundwater monitoring wells at Sites 13 and 19, four of which were selected for quarterly sampling, including three at Site 13 and one at Site 19. These four wells were sampled during Quarters 1 and 2. Two additional Site 19 wells were added to the monitoring program prior to Quarter 3 sampling. A total of six selected wells were sampled during Quarters 3 and 4. The two additional wells (D19-01 and MWD13-2) are among seven wells from various sites added to the monitoring program for Quarters 3 and 4. During prior sampling at this site, petroleum hydrocarbons, and BTEX compounds were detected in groundwater.

For each quarter, Table 4.0-1 lists the groundwater wells that were sampled at Sites 13 and 19 and identifies the parameters for which the samples were analyzed. The locations of these wells are shown on Figure 1.2-3.

##### **4.11.1 Sampling Plan Rationale**

Well M13-06 is located in the center of a petroleum hydrocarbon plume originating at Site 13. The remaining three wells that were sampled at the site for four quarters are located near the margins of the plume, which is migrating to the southeast. The two Site 19 wells added to the monitoring program for Quarters 3 and 4 are located northwest of the plume, within the hazardous waste storage area. Five wells are screened in the FWBZ (M13-06, M13-09, MWOR-5, MWD13-2 and MWD13-3) and one well is screened in the SWBZ (D19-01).

Samples from four wells during Quarters 1 and 2 and six wells during Quarters 3 and 4 were analyzed for VOCs. Samples from well M13-06 were also analyzed for SVOCs. Data from these analyses (and from TPH analyses, noted below) were collected to assess the migration of the petroleum hydrocarbon plume at the site. Data from well MW530-2, located at Site 23 (see Section 4.15), will also be used to assess the extent of petroleum hydrocarbons originating at Site 13.

Samples from each of the four wells during Quarters 1 and 2 and six wells during Quarters 3 and 4 were also analyzed for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from Site 13 and 19 wells were also analyzed for TPPH and TEPH. In addition, samples from four of the wells were analyzed for TOC during the first quarterly sampling event. The TOC data were collected to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential. Sections 4.11.2 through 4.11.5 present the analytical results for each quarter of sampling.

#### **4.11.2 Quarter 1 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from the Site 19 monitoring well (MWD13-3, screened in the FWBZ) during Quarter 1. This well is shown on Figure 4.1-1, Sheet 1, along with the FWBZ wells from various sites with detected organic compounds exceeding the MCLs. Inorganic constituents exceeded the MCLs in all three Site 13 wells (M13-06, M13-09, and MWOR-5, screened in the FWBZ), but not in the Site 19 well (MWD13-2) during Quarter 1 sampling. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1.

Organic analytical results for compounds detected during Quarter 1 in groundwater samples collected at the three Site 13 and one Site 19 monitoring wells, are presented on Table 4.11-1. VOCs were detected at low concentrations in the Site 19 well. Concentrations of 1,1,1-TCA and 1,1-DCA were detected in MWD13-3. No VOCs were detected in M13-06, M13-09, or MWOR-5. Groundwater from one well, M13-06, was analyzed for SVOCs and there were no detections.

Groundwater samples from all four wells were analyzed for TEPH and TPPH. Motor oil was detected in well M13-06. In the three wells sampled at the margins of the petroleum plume (M13-09, MWOR-5, and MWD13-3), petroleum hydrocarbons were detected in the wells located in the southeasterly portion of the site (M13-09 and MWOR-5). Well M13-09 exhibited detected concentrations of motor oil and diesel. Gasoline was detected in well MWOR-5. No petroleum hydrocarbons were detected in well MWD13-3, located in the northwestern section of Site 13.

Eight metals were detected in one or more groundwater samples from the four monitoring wells analyzed for metals during Quarter 1. Detected concentrations of arsenic (in three wells), barium (in four wells and one duplicate), cobalt (in two wells and one duplicate), copper (in one well and one duplicate), manganese (in four wells and one duplicate), nickel (in two wells and one duplicate), selenium (in two wells), and silver (in one well) are shown in Table 4.11-2.

All four of the Site 13 and 19 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. All four wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.11-3.

#### **4.11.3            Quarter 2 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one of the Sites 13 and 19 monitoring wells (MWD13-3, screened in the FWBZ and located within Site 19) during Quarter 2 sampling. This well is shown on Figure 4.1-1, Sheet 2. Inorganic constituents exceeded the MCLs in three wells screened in the FWBZ, including Site 13 wells M13-09 and MWOR-5 and Site 19 well MWD13-3 during Quarter 2 sampling. The FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 2.

Organic analytical results for compounds detected in groundwater samples collected at the three Site 13 and one Site 19 monitoring wells during Quarter 2, are presented on Table 4.11-1. VOCs were detected at low concentrations in the Site 19 well. 1,1-DCA was detected in MWD13-3 at a concentration of 2  $\mu\text{g/L}$ . No VOCs were detected in M13-06, M13-09, or MWOR-5 or its duplicate. Groundwater from M13-06 was analyzed for SVOCs and there were no detections.

Groundwater samples from all four wells were analyzed for TEPH and TPPH during Quarter 2. In the three wells sampled at the margins of the petroleum plume (M13-09, MWOR-5, and MWD13-3),

petroleum hydrocarbons were detected in the wells located in the southeasterly portion of the site (M13-09 and MWOR-5). Well M13-09 exhibited detected concentrations of motor oil and diesel. Motor oil was also detected in well MWOR-5, but diesel was not detected in this well. Gasoline was not detected in the four wells from Sites 13 and 19 during Quarter 2 sampling. No petroleum hydrocarbons were detected in well M13-06, located within the petroleum hydrocarbon plume or in well MWD13-3, located within Site 19, in the northwestern corner of Site 13.

Seven metals were detected in one or more groundwater samples from the four monitoring wells analyzed for metals during Quarter 2. Detected concentrations of barium (in four wells and one duplicate), cadmium (in three wells and one duplicate), chromium (in one well), manganese (in three wells and one duplicate), nickel (in one well and its duplicate), silver (in one well), and zinc (in two wells) are shown in Table 4.11-2.

All four of the Sites 13 and 19 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.11-3.

#### **4.11.4 Quarter 3 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the six monitoring wells sampled at Sites 13 and 19 during Quarter 3. Inorganic constituents exceeded the MCLs during Quarter 3 sampling in four wells screened in the FWBZ (M13-06, M13-09, MWD13-3, and MWOR-5) and one well screened in the SWBZ (D19-01). The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figures 4.1-3, Sheet 3 and 4.1-4, Sheet 3, respectively.

Organic analytical results for compounds detected in groundwater samples collected at the Site 13 and 19 monitoring wells during Quarter 3, are presented on Table 4.11-1. VOCs were detected at low concentrations in well MWD13-3. 1,1-DCA was detected in this well at a concentration of 3  $\mu\text{g/L}$ . VOCs were not detected in the five remaining wells. Groundwater from M13-06 was analyzed for SVOCs and there were no detections.

Groundwater samples from all six wells were analyzed for TEPH and TPPH during Quarter 3. The three wells sampled at the margins of the petroleum plume (M13-09, MWOR-5, and MWD13-3) exhibited detectable concentrations of petroleum hydrocarbons. Well M13-09 exhibited detected concentrations of

diesel (0.10 mg/L), motor oil (0.36 mg/L), and gasoline (0.31 mg/L). Gasoline, but not diesel or motor oil, was also detected in wells MWOR-5 and MWD13-3 at concentrations of 0.42 and 0.046 mg/L. No petroleum hydrocarbons were detected in well M13-06, located within the petroleum hydrocarbon plume.

Eleven metals were detected in one or more groundwater samples from the six monitoring wells analyzed for metals during Quarter 3. Detected concentrations of arsenic (in one well), barium (in five wells and one duplicate), cadmium (in three wells), chromium (in four wells and one duplicate), cobalt (in three wells), copper (in one duplicate sample, but not the associated original sample), manganese (in all six wells and one duplicate), molybdenum (in five wells and one duplicate), nickel (in all six wells and one duplicate), vanadium (in two wells and one duplicate), and zinc (in five wells and one duplicate) are shown in Table 4.11-2.

All six of the Site 13 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.11-3.

#### **4.11.5 Quarter 4 Analytical Results**

Organic compounds were detected at concentrations exceeding the MCLs in groundwater from one monitoring well (MWD13-3, screened in the FWBZ) sampled at Sites 13 and 19 during Quarter 4, as shown on Figure 4.1-1, Sheet 4. Inorganic constituents exceeded the MCLs during Quarter 4 sampling in five wells screened in the FWBZ (M13-06, M13-09, MWD13-2, MWD13-3, and MWOR-5) and one well screened in the SWBZ (D19-01). The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figures 4.1-3, Sheet 4, and 4.1-4, Sheet 4, respectively.

Organic analytical results for compounds detected in groundwater samples collected at the Site 13 and 19 monitoring wells during Quarter 4, are presented on Table 4.11-1. VOCs were detected at low concentrations in Site 19 wells MWD13-2 and MWD13-3. 1,1-DCA was detected in both wells at concentrations of 1 and 6  $\mu\text{g/L}$ , respectively. 1,1,1-TCA was detected in well MWD13-3 at a concentration of 1  $\mu\text{g/L}$ . VOCs were not detected in the four remaining wells. Groundwater from M13-06 was analyzed for SVOCs and there were no detections.

Groundwater samples from all six wells were analyzed for TEPH and TPPH during Quarter 4. Two of the three wells sampled at the margins of the petroleum hydrocarbon plume (M13-09 and MWD13-3) exhibited low detectable concentrations of petroleum hydrocarbons. Well M13-09 exhibited detected

concentrations of diesel (0.08 mg/L) and motor oil (0.34 mg/L), but not gasoline, while well MWD13-3 exhibited detected concentrations of motor oil (0.14 mg/L). Hydrocarbons were detected in the two wells located northeast of the plume. Gasoline, diesel, and motor oil were detected in MWD13-2 at concentrations of 0.028 mg/L, 0.19 mg/L, and 0.57 mg/L. Motor oil was detected in well D19-01 at a concentration of 0.18 mg/L. No petroleum hydrocarbons were detected in well M13-06, located within the petroleum hydrocarbon plume.

Ten metals were detected in one or more groundwater samples from the six monitoring wells analyzed for metals during Quarter 4. Detected concentrations of barium (in all six wells and one duplicate), cadmium (in three wells and one duplicate), cobalt (in five wells), lead (in one well), manganese (in all six wells and one duplicate), molybdenum (in two wells), nickel (in one well), thallium (in one well), vanadium (in four wells and one duplicate), and zinc (in two wells) are shown in Table 4.11-2.

All six of the Sites 13 and 19 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.11-3.

#### **4.11.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Site 19, changes in chemical type and concentration were followed over a period from 1997 to 1998. A time-series plot (Figure 4.11-1) was prepared for one monitoring well (MWD13-3) at Site 19, located within the northern margin of a groundwater contaminant plume depicted in Figure 6-6. The chlorinated solvent plume is extremely small and appears to be separate from a much larger chlorinated solvent plume located to the north at Site 4. Chlorinated solvent concentrations have generally remained the same over the one year time frame, decreasing during periods of precipitation induced dilution and increasing during the dry summer months. No substantive increases in the concentration of the parent compound (TCE) was observed.

**TABLE 4.11-1  
SITES 13 AND 19  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)**

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
ML3-06	108-S13-001	11/06/97	2-BUTANONE: R ACETONE: R	ND	NA	MOTOR OIL RANGE ORGANICS: 0.3Y	NA
ML3-09	108-S13-002	11/06/97	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.1J MOTOR OIL RANGE ORGANICS: 0.7Y	NA
MWD13-3	108-S19-001	11/10/97	1,1,1-TRICHLOROETHANE: 1J 1,1,1-DICHLOROETHANE: 6J 2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
MWOR-5	108-S13-003	11/07/97	ACETONE: R	NA	NA	GASOLINE RANGE ORGANICS: 0.029J	NA
MWOR-5	108-S13-004*	11/07/97	ACETONE: R	NA	NA	ND	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected  
\* = Duplicate sample

TABLE 4.11-1  
SITES 13 AND 19  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M13-06	108-S13-005	02/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ND	NA	ND	NA
M13-09	108-S13-006	02/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.13J MOTOR OIL RANGE ORGANICS: 0.45J	NA
MWOR-5	108-S13-007	02/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.21J	NA
MWOR-5	108-S13-008	02/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
MWD13-3	108-S19-002	02/12/98	1,1-DICHLOROETHANE: 2 2-BUTANONE: R ACETONE: R	NA	NA	ND	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected



TABLE 4.11-1  
SITES 13 AND 19  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M13-06	108-S13-009	05/06/98	2-BUTANONE: R ACETONE: R	ND	NA	ND	NA
M13-09	108-S13-010	05/12/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.10J MOTOR OIL RANGE ORGANICS: 0.36J GASOLINE RANGE ORGANICS: 0.031J	NA
MWD13-2	108-S04-046	05/06/98	2-BUTANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.54J	NA
MW0R-5	108-S13-011	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	GASOLINE RANGE ORGANICS: 0.042J	NA
MW0R-5	108-S13-012	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	GASOLINE RANGE ORGANICS: 0.049J	NA
D19-01	108-S04-045	05/08/98	2-BUTANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.32J	NA
MWD13-3	108-S19-003	05/13/98	1,1-DICHLOROETHANE: 3 2-BUTANONE: R ACETONE: R	NA	NA	GASOLINE RANGE ORGANICS: 0.046J	NA

Notes:

µg/L = Micrograms per liter

mg/L = Milligrams per liter

NA = Not analyzed

R = Rejected

\* Field duplicate samples: 108-S13-011 / 108-S13-012

PCBs = Polychlorinated biphenyls

J = Value estimated at reported concentration

ND = Not detected

TABLE 4.11-1  
SITES 13 AND 19  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M13-06	108-S13-013	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ND	NA	DIESEL RANGE ORGANICS: R MOTOR OIL RANGE ORGANICS: R	NA
M13-09	108-S13-014	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.079J MOTOR OIL RANGE ORGANICS: 0.34J	NA
MWR-5	108-S13-015	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
MWR-5	108-S13-016	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: R	NA
D19-01	108-S19-004	08/06/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.18J	NA
MWD13-2	108-S19-005	08/10/98	1,1-DICHLOROETHANE: 1 2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.19J MOTOR OIL RANGE ORGANICS: 0.57J GASOLINE RANGE ORGANICS: 0.028J	NA
MWD13-3	108-S19-006	08/11/98	1,1,1-TRICHLOROETHANE: 1 1,1-DICHLOROETHANE: 6 2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	MOTOR OIL RANGE ORGANICS: 0.14J	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	ND = Not detected
R = Rejected	

TABLE 4.11-2  
SITES 13 AND 19  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
M13-06	108-S13-001	11/06/97	<0.65	6.6	39.5J	<0.15	<0.36	<0.30	<0.40	<0.65	<0.65	449	<0.10	<1.9	<1.9	1.2J	<0.35	<0.90	<0.40	<13.0
M13-09	108-S13-002	11/06/97	<0.65	7.9	80.3J	<0.15	<0.40	<0.58	2.3J	<0.92	<0.78	2970	<0.10	<0.30	<6.3	1.6J	0.68J	<0.90	<0.87	<10.2
MWD13-3	108-S19-001	11/10/97	<1.8	2.3J	44.3J	<0.15	<0.15	<0.40	<0.40	<0.65	<0.65	45.9	<0.10	<3.8	4.7J	<1.0	<0.35	<0.90	<3.0	<3.8
MWOR-5	108-S13-003	11/07/97	<0.74	<1.0	54.5J	<0.15	<0.15	<0.32	1.3J	2.7J	<0.65	156	<0.10	<0.86	8.8	<1.0	<0.35	<0.90	<2.6	<2.7
MWOR-5	108-S13-004*	11/07/97	<0.71	<1.0	55.6J	<0.15	<0.15	<0.54	1.3J	3.0J	<0.65	151	<0.10	<0.98	9.0	<1.0	<0.35	<0.90	<2.5	<7.3

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
\* = Duplicate sample

TABLE 4.11-2  
SITES 13 AND 19  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M13-06	108-S13-005	02/10/98	<0.70	<0.80	47.1J	<0.10	<0.20	<1.1	<0.25	<2.7	<0.62	<2.8	<0.10	<2.6	<1.3	<0.80	<0.15	<1.3	<1.8	20.2
M13-09	108-S13-006	02/10/98	<0.70	<5.0	63.2J	<0.10	0.22J	<0.68	<1.5	<0.70	<1.0	3090	<0.10	<0.25	<2.6	<0.80	0.31J	<1.3	<0.30	8.5J
MWOR-5	108-S13-007	02/10/98	<0.70	<0.80	53.8J	<0.10	0.38J	<0.58	<1.4	<2.9	<1.1	146	<0.10	<0.76	8.9	<0.80	<0.15	<1.3	<2.2	<4.3
MWOR-5	108-S13-008	02/10/98	<0.70	<0.80	51.2J	<0.10	0.45J	<0.62	<1.4	<3.0	<0.60	140	<0.10	<1.1	7.8J	<0.80	<0.15	<1.3	<2.2	<5.8
MWD13-3	108-S19-002	02/12/98	<0.70	<1.2	29.3J	<0.10	0.91J	0.22J	<0.25	<0.35	<0.70	57.0	<0.10	<1.8	<2.1	<0.90	<0.15	<1.4	<0.57	<6.5

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.11-2  
SITES 13 AND 19  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M13-06	108-S13-009	05/06/98	<1.5	<1.2	321	<0.10	<0.15	1.3J	<0.30	<3.7	<0.50	77.7	<0.10	2.6J	1.8J	R	<0.30	<1.4	2.8J	96.2
M13-09	108-S13-010	05/12/98	<0.85	1.4J	310	<0.10	0.51J	1.1J	1.2J	<3.7	<1.1	1720	<0.10	<0.50	3.8J	<0.85	<0.30	<1.4	<0.76	118
MWOR-5	108-S13-011	05/13/98	<0.85	<1.5	388	<0.10	<0.15	11.4	4.5J	<9.4	<1.4	240	<0.10	1.0J	22.3	R	<0.30	<1.4	10.1J	141
MWOR-5	108-S13-012	05/13/98	<0.85	<1.7	362	<0.10	<0.15	14.9	5.3J	10.4J	<3.2	258	<0.10	0.94J	25.4	R	<0.30	<1.4	12.7J	127
MWD13-3	108-S19-003	05/13/98	<0.85	<1.0	265	<0.10	<0.26	1.2J	<0.30	<4.2	<6.9	63.8	<0.10	1.9J	2.7J	R	<0.30	<1.4	<1.9	35.2

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit  
 R = Rejected

TABLE 4.11-2  
SITES 13 AND 19  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
M13-06	108-S13-013	08/07/98	<3.3	<9.5	56.9J	<0.20	<0.30	<0.80	3.2J	<1.1	<1.7	86.4	<0.10	3.0J	<0.82	<2.2	<0.70	<1.1	1.8J	<3.8
M13-09	108-S13-014	08/07/98	<2.7	<4.3	100J	<0.20	5.3	<0.80	4.3J	<2.1	<1.7	2970	<0.10	<1.0	<4.2	<2.2	<0.70	<1.1	0.63J	<5.8
MWOR-5	108-S13-015	08/07/98	<2.7	<2.1	51.1J	<0.20	0.54J	<0.80	4.4J	<5.2	2.9J	156	<0.10	1.7J	<8.9	<2.2	<0.70	<1.1	2.4J	7.4J
MWOR-5	108-S13-016	08/07/98	<1.8	<2.2	52.8J	<0.20	1.0J	<0.80	<2.0	<5.0	<1.7	154	<0.10	<1.0	<9.0	<2.2	<0.70	<1.1	2.3J	<0.94
D19-01	108-S19-004	08/06/98	<2.4	<2.6	52.6J	<0.20	5.3	<0.80	2.5J	<1.4	<1.7	1930	<0.10	<1.0	<34.1	<2.2	<0.70	<7.0	<0.60	142
MWD13-2	108-S19-005	08/10/98	<1.8	<2.7	91.0J	<0.20	<0.30	<0.80	<0.40	<2.0	<1.7	205	<0.10	<1.5	5.9J	<2.2	<0.70	1.4J	2.2J	<4.7
MWD13-3	108-S19-006	08/11/98	<1.8	<2.3	32.4J	<0.20	<0.30	<0.80	3.2J	<3.5	<1.7	64.5	<0.10	<2.3	<2.2	<2.2	<0.70	<1.1	<0.77	<1.3

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit

TABLE 4.11-3  
SITES 13 AND 19  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M13-06	108-S13-001	11/06/97	Alkalinity: 324 Bicarbonate: 324	Bromide: 0.10 Chloride: 21.4 Fluoride: 0.54 Phosphate: 0.72 Sulfate: 20.9	Total Dissolved Solids: 460	ND	TOC Test 2: 13 Total Organic Carbon: 14
M13-09	108-S13-002	11/06/97	Alkalinity: 259 Bicarbonate: 259	Bromide: 0.50 Chloride: 21.0 Fluoride: 0.19 Nitrate-N: 0.14 Sulfate: 37.3	Total Dissolved Solids: 710	ND	TOC Test 2: 8 Total Organic Carbon: 8
MWD13-3	108-S19-001	11/10/97	Alkalinity: 136 Bicarbonate: 100 Carbonate: 35.4	Bromide: 0.15 Chloride: 28.9 Fluoride: 0.35 Phosphate: 0.10 Sulfate: 81.4	Total Dissolved Solids: 440	ND	TOC Test 2: 3 Total Organic Carbon: 4
MWOR-5	108-S13-003	11/07/97	Alkalinity: 206 Bicarbonate: 206	Bromide: 0.18 Chloride: 14.5 J Fluoride: 0.48 Nitrate-N: 2.0 Nitrite-N: 0.17 Phosphate: 0.14 Sulfate: 44.1 J	Total Dissolved Solids: 290	ND	TOC Test 2: 7 J Total Organic Carbon: 6

Notes:

mg/L = Milligrams per liter

ND = Not detected

TABLE 4.11-3  
SITE 13 AND 19  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)		Anions (mg/L)		Total Dissolved Solids (mg/L)
M13-06	108-S13-005	02/10/98	Alkalinity:	141	Chloride:	6.2	Total Dissolved Solids: 210
			Bicarbonate:	141	Fluoride:	0.23	
					Nitrate:	0.22	
					Sulfate:	7.8	
M13-09	108-S13-006	02/10/98	Alkalinity:	211	Bromide:	0.42	Total Dissolved Solids: 390
			Bicarbonate:	211	Chloride:	21.4	
					Nitrate:	7.8	
					Sulfate:	71	
MWOR-5	108-S13-007	02/10/98	Alkalinity:	212	Bromide:	0.24	Total Dissolved Solids: 190
			Bicarbonate:	212	Chloride:	13.3	
					Fluoride:	0.3	
					Nitrate:	1.7	
					Nitrite:	0.18	
					Phosphate:	0.14	
					Sulfate:	37.2	
MWD13-3	108-S19-002	02/12/98	Alkalinity:	137	Bromide:	0.15	Total Dissolved Solids: 240
			Bicarbonate:	137	Chloride:	29.7	
					Fluoride:	0.18	
					Phosphate:	0.13	
					Sulfate:	51.8	

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration



TABLE 4.11-3  
SITES 13 AND 19  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M13-06	108-S13-009	05/06/98	Alkalinity: 209 Bicarbonate: 209	Chloride: 6 Fluoride: 0.22 Nitrate-N: 0.22 Sulfate: 14.8 J	Total Dissolved Solids: 340	ND	NA
M13-09	108-S13-010	05/12/98	Alkalinity: 229 Bicarbonate: 229	Bromide: R Chloride: 19.4 Nitrate-N: 3.8 Sulfate: 63	Total Dissolved Solids: 520	ND	NA
MWD13-3	108-S19-003	05/13/98	Alkalinity: 139 Bicarbonate: 139	Bromide: 0.11 Chloride: 14.4 Fluoride: 0.19 J Phosphate: 0.13 J Sulfate: 35.9 J	Total Dissolved Solids: 340	Total Sulfide: 1.1 J	NA
MWOR-5	108-S13-011	05/13/98	Alkalinity: 187 Bicarbonate: 187	Bromide: 0.24 Chloride: 13.6 Fluoride: 0.39 J Nitrate-N: 3.2 Nitrite-N: 0.17 Phosphate: 0.16 J Sulfate: 39.4 J	Total Dissolved Solids: 860	Total Sulfide: 1.0 J	NA
D19-01	108-S04-045	05/08/98	Alkalinity: 160 Bicarbonate: 160	Bromide: 21.9 Chloride: 8690 J Sulfate: 852	Total Dissolved Solids: 21000	ND	ND
MWD13-2	108-S04-046	05/06/98	Alkalinity: 101 Bicarbonate: 101	Fluoride: 0.12 Nitrate-N: 0.15 Phosphate: 0.14 Sulfate: 14.9 J	ND	ND	ND

Notes:

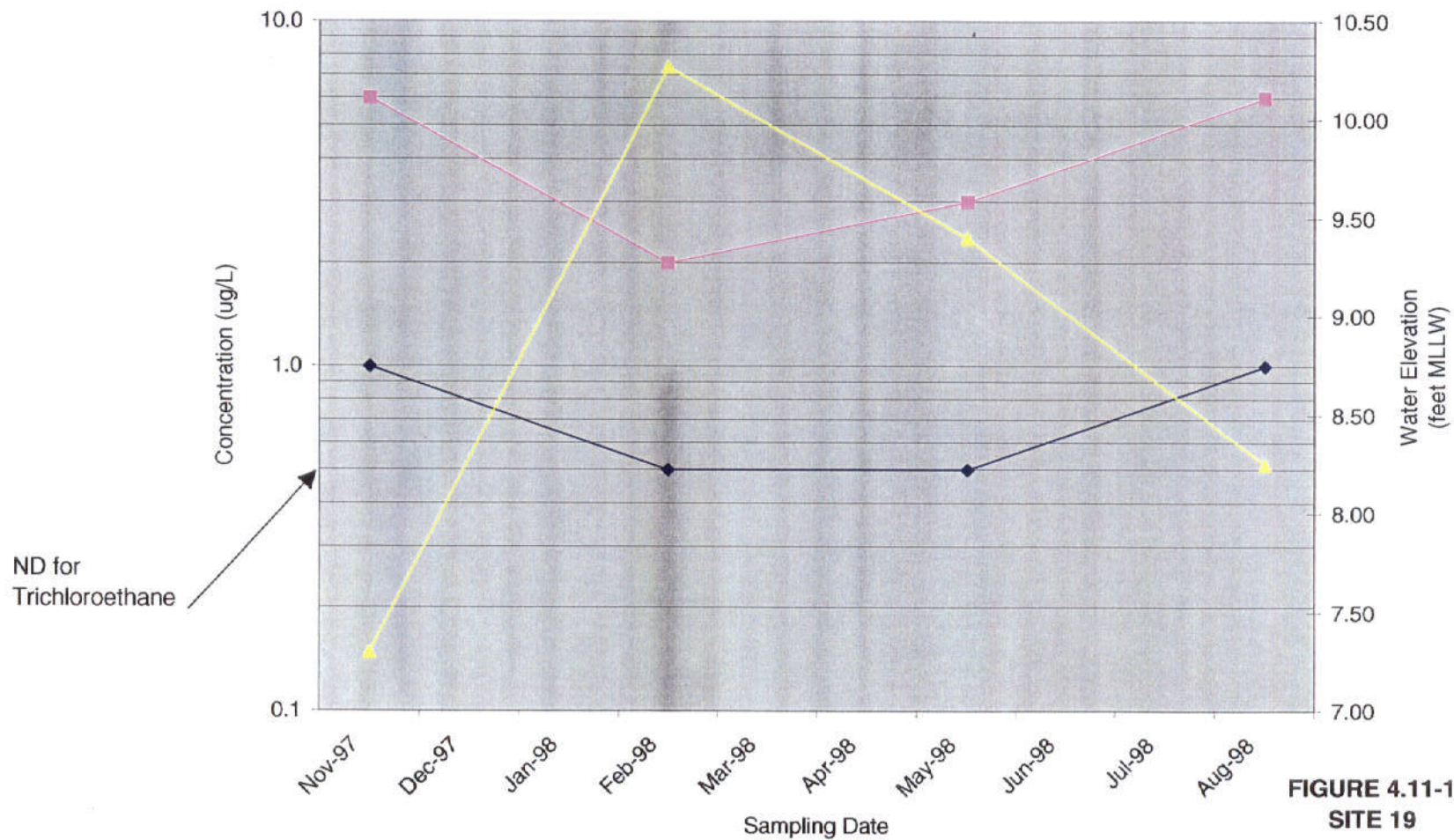
J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected  
R = Rejected

TABLE 4.11-3  
SITES 13 AND 19  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M13-06	108-S13-013	08/07/98	Alkalinity: 228 Bicarbonate: 228	Chloride: 10.6 Sulfate: 8.3	Total Dissolved Solids: 340	ND	NA
M13-09	108-S13-014	08/07/98	Alkalinity: 211 Bicarbonate: 211	Bromide: 0.62 Chloride: 26.5 Nitrate-N: 4.9 Sulfate: 69.4	Total Dissolved Solids: 510	ND	NA
MWOR-5	108-S13-015	08/07/98	Alkalinity: 213 Bicarbonate: 213	Chloride: 14.1 Nitrate-N: 3.5 Sulfate: 44.0	Total Dissolved Solids: 370	Total Sulfide: 1.0	NA
D19-01	108-S19-004	08/06/98	Alkalinity: 146 Bicarbonate: 146	Bromide: 24.8 Chloride: 7010 Nitrate-N: 0.64 Sulfate: 764	Total Dissolved Solids: 14000	ND	ND
MWD13-2	108-S19-005	08/10/98	Alkalinity: 213 Bicarbonate: 213	Chloride: 31.40 J Phosphate: 1.20 Sulfate: 12.0	Total Dissolved Solids: 260	ND	ND
MWD13-3	108-S19-006	08/11/98	Alkalinity: 162 Bicarbonate: 162	Chloride: 22.0 J Sulfate: 56.4	Total Dissolved Solids: 280	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected



**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.11-1**  
**SITE 19**  
**MONITORING WELL MWD13-3**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

#### **4.12 SITE 14 – FIRE TRAINING AREA**

Site 14 is located on the northern perimeter of Alameda Point (Figure 1.2-2). The site was used as a fire training area and fire extinguisher discharge area. Waste fuels and oils were discharged at the site and were burned during training exercises (PRC and Montgomery Watson 1993c).

Currently, there are four groundwater monitoring wells at Site 14; only one was selected for quarterly sampling. During prior sampling of the Site 14 wells, petroleum hydrocarbons were detected in groundwater at the site.

Table 4.0-1 lists the one groundwater well that was sampled at Site 14 and identifies the parameters for which the samples were analyzed, by quarter. The location of this well is shown on Figure 1.2-3.

##### **4.12.1 Sampling Plan Rationale**

Well M101-A is located in an area where petroleum hydrocarbons have been previously detected. The well is screened in the FWBZ.

Samples from well M101-A were analyzed for VOCs, TPPH, and TEPH. Data from these analyses were collected to assess petroleum hydrocarbon concentrations in the area.

The quarterly samples were analyzed for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from well M101-A were also analyzed for TOC during the first quarterly sampling event. The TOC data were collected to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential. Sections 4.12.2 through 4.12.5 present the analytical results for each quarter of sampling.

#### **4.12.2 Quarter 1 Analytical Results**

Organic compounds were detected during Quarter 1 at concentrations exceeding the MCLs in groundwater from the Site 14 monitoring well, M101-A, screened in the FWBZ. This well is shown on Figure 4.1-1, Sheet 1, along with the FWBZ wells from various sites with detected organic compounds exceeding the MCLs. One or more inorganic constituents also exceeded the MCLs in groundwater from this well, as shown on Figure 4.1-3, Sheet 1.

Table 4.12-1 presents the organic compounds detected in groundwater samples collected at Site 14 during Quarter 1. Three VOCs, 1,1-DCA, cis-1,2-DCE, and vinyl chloride, were detected in M101-A. The highest detected concentration of VOCs was vinyl chloride at a concentration of 390  $\mu\text{g/L}$ .

Groundwater from well M101-A was also analyzed for total petroleum hydrocarbons. Diesel and gasoline were detected at concentrations of 0.4 mg/L for diesel and 0.61 mg/L for gasoline.

Table 4.12-2 presents the inorganic constituents detected in groundwater from Site 14. Arsenic, barium, and manganese were detected during Quarter 1 sampling.

Monitoring well M101-A was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity and TOC. The results are presented on Table 4.12-3.

#### **4.12.3 Quarter 2 Analytical Results**

Organic compounds were detected during Quarter 2 at concentrations exceeding the MCLs in groundwater from the Site 14 monitoring well, M101-A, screened in the FWBZ. This well is shown on Figure 4.1-1, Sheet 2. One or more inorganic constituents also exceeded the MCLs in groundwater from this well, as shown on Figure 4.1-3, Sheet 2.

Table 4.12-1 presents the organic compounds detected in groundwater samples collected at Site 14 during Quarter 2. Ten VOCs including, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, cis-1,2-DCE, PCE, toluene, trans-1,2-DCE, TCE, vinyl chloride, and total xylenes, were detected in groundwater from well M101-A. The highest detected concentrations of VOCs were cis-1,2-DCE and vinyl chloride at concentrations of 270 and 250  $\mu\text{g/L}$ , respectively.

Groundwater from well M101-A was also analyzed for TEPH and TPPH. Diesel, motor oil, and gasoline were detected at concentrations of 0.48 mg/L for diesel, 1.7 mg/L for motor oil, and 0.25 mg/L for gasoline.

Table 4.12-2 presents the inorganic constituents detected in groundwater from Site 14. Arsenic, barium, cadmium, manganese, mercury, nickel, and silver were detected during Quarter 2 sampling.

Monitoring well M101-A was also analyzed during Quarter 2 for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.12-3.

#### **4.12.4 Quarter 3 Analytical Results**

Organic compounds were detected during Quarter 3 at concentrations exceeding the MCLs in groundwater from the Site 14 monitoring well, M101-A, screened in the FWBZ. This well is shown on Figure 4.1-1, Sheet 3. One or more inorganic constituents also exceeded the MCLs in groundwater from this well, as shown on Figure 4.1-3, Sheet 3.

Table 4.12-1 presents the organic compounds detected in groundwater samples collected at Site 14 during Quarter 3. Eleven VOCs including, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, cis-1,2-DCE, ethylbenzene, PCE, toluene, trans-1,2-DCE, TCE, vinyl chloride, and total xylenes, were detected in M101-A. The highest detected concentrations of VOCs were cis-1,2-DCE and vinyl chloride at concentrations of 750 and 510  $\mu\text{g/L}$ , respectively.

Groundwater from well M101-A was also analyzed for TEPH and TPPH. Diesel, motor oil, and gasoline were detected at concentrations of 0.61 mg/L for diesel, 0.44 mg/L for motor oil, and 0.78 mg/L for gasoline.

Table 4.12-2 presents the inorganic constituents detected in groundwater from Site 14. Arsenic, barium, cadmium, chromium, cobalt, manganese, molybdenum, nickel, and zinc were detected during Quarter 3 sampling.

Monitoring well M101-A was also analyzed during Quarter 3 for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.12-3.

#### **4.12.5 Quarter 4 Analytical Results**

Organic compounds were detected during Quarter 4 at concentrations exceeding the MCLs in groundwater from the Site 14 monitoring well, M101-A, screened in the FWBZ. This well is shown on Figure 4.1-1, Sheet 4. One or more inorganic constituents also exceeded the MCLs in groundwater from this well, as shown on Figure 4.1-3, Sheet 4.

Table 4.12-1 presents the organic compounds detected in groundwater samples collected at Site 14 during Quarter 4. Eleven VOCs including, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, cis-1,2-DCE, ethylbenzene, PCE, toluene, trans-1,2-DCE, TCE, vinyl chloride, and total xylenes, were detected in M101-A. The highest detected concentrations of VOCs were cis-1,2-DCE and vinyl chloride at concentrations of 900 and 910  $\mu\text{g/L}$ , respectively.

Groundwater from well M101-A was also analyzed for TEPH and TPPH. Diesel, motor oil, and gasoline were detected at concentrations of 1.10 mg/L for diesel, 1.30 mg/L for motor oil, and 1.10 mg/L for gasoline.

Table 4.12-2 presents the inorganic constituents detected in groundwater from Site 14. Arsenic, barium, chromium, cobalt, and manganese were detected during Quarter 4 sampling.

Monitoring well M101-A was also analyzed during Quarter 4 for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.12-3.

#### **4.12.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Site 14, changes in chemical type and concentration were followed over a period from 1994 through 1998. A time-series plot (Figure 4.12-1) was prepared for one monitoring well (M101-A) at Site 14, located within a chlorinated solvent contaminant plume depicted in Figures 6-1 and 6-2. The time-series plot presents a more diverse group of chemicals than the three representative chemicals shown in the contaminant plumes in Figures 6-1 and 6-2.

Chlorinated solvent concentrations within monitoring well M101-A have generally increased over the four year time frame. A slight reduction in the concentrations of the parent compounds (PCE, TCE, and TCA) and an increase in the concentrations of the degradation products (DCE, DCA, and vinyl chloride) has occurred. The concentrations of the parent chemicals has changed dramatically over the last four years, decreasing to near chemical reporting limits in the fall of 1997. However, in the spring of 1998 during a period of precipitation, the concentrations of PCE, TCE, and TCA increased 1 to 2 orders of magnitude. This behavior suggests that residual solvent may have been flushed from the overlying soil or capillary fringe in response to infiltrating rainwater.



TABLE 4.12-1  
SITE 14  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M101-A	108-S14-001	11/07/97	1,1-DICHLOROETHANE: 110 ACETONE: R CIS-1,2-DICHLOROETHENE: 100 VINYL CHLORIDE: 390J	NA	NA	DIESEL RANGE ORGANICS: 0.4J GASOLINE RANGE ORGANICS: 0.61J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.12-1  
SITE 14  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M101-A	108-S14-002	02/11/98	1,1,1-TRICHLOROETHANE: 11 1,1-DICHLOROETHANE: 130 1,1-DICHLOROETHENE: 1 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 270 TETRACHLOROETHENE: 26J TOLUENE: 2 TRANS-1,2-DICHLOROETHENE: 4 TRICHLOROETHENE: 9 VINYL CHLORIDE: 250 XYLENE (TOTAL): 6	NA	NA	DIESEL RANGE ORGANICS: 0.48J MOTOR OIL RANGE ORGANICS: 1.7J GASOLINE RANGE ORGANICS: 0.25J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.12-1  
SITE 14  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M101-A	108-S14-003	05/13/98	1,1,1-TRICHLOROETHANE: 28 1,1-DICHLOROETHANE: 88 1,1-DICHLOROETHENE: 3 2-BUTANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 750 ETHYLBENZENE: 4 TETRACHLOROETHENE: 7 TOLUENE: 26 TRANS-1,2-DICHLOROETHENE: 3 TRICHLOROETHENE: 5 VINYL CHLORIDE: 510J XYLENE (TOTAL): 26	NA	NA	DIESEL RANGE ORGANICS: 0.61J MOTOR OIL RANGE ORGANICS: 0.44J GASOLINE RANGE ORGANICS: 0.78J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.12-1  
SITE 14  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M101-A	108-S14-004	08/11/98	1,1,1-TRICHLOROETHANE: 36 1,1-DICHLOROETHANE: 210 1,1-DICHLOROETHENE: 3J 2-BUTANONE: R 2-HEXANONE: R ACETONE: R CIS-1,2-DICHLOROETHENE: 900J ETHYLBENZENE: 11J TETRACHLOROETHENE: 6J TOLUENE: 63 TRANS-1,2-DICHLOROETHENE: 5J TRICHLOROETHENE: 2J VINYL CHLORIDE: 910J XYLENE (TOTAL): 58	NA	NA	DIESEL RANGE ORGANICS: 1.1J MOTOR OIL RANGE ORGANICS: 1.3J GASOLINE RANGE ORGANICS: 1.1J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.12-2  
SITE 14  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M101-A	108-S14-001	11/07/97	<0.88	15.9	146	<0.15	<0.15	<1.1	<0.40	<0.65	<0.65	1360	<0.10	<1.1	<1.4	<1.0	<0.35	<0.90	<0.48	<5.8

Notes:  
µg/L = Micrograms per liter  
J. = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.12-2  
SITE 14  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
M101-A	108-S14-002	02/11/98	<0.70	11.8	120	<0.10	0.74J	<1.3	<0.80	<1.2	<0.70	1750	0.11J	<2.1	4.7J	<1.8	0.15J	<1.4	<0.75	<5.0

Notes:  
 $\mu\text{g/L}$  = Micrograms per liter  
 J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.12-2  
SITE 14  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			( $\mu\text{g/L}$ )																	
M101-A	108-S14-003	05/13/98	<0.85	28.8	431	<0.10	0.86J	2.9J	0.41J	<4.3	<1.2	1700	<0.10	1.6J	4.1J	R	<0.30	<1.4	<2.2	102

Notes:

$\mu\text{g/L}$  = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

R = Rejected

TABLE 4.12-2  
SITE 14  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M101-A	108-S14-004	08/11/98	<1.8	27.3	317	<0.20	<0.30	1.4J	2.8J	<3.6	<1.7	2250	<0.10	<1.0	<2.2	<2.2	<0.70	<1.1	<0.94	<0.45

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit



TABLE 4.12-3  
 SITE 14  
 QUARTER 1  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 (Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M101-A	108-S14-001	11/07/97	Alkalinity: 566 Bicarbonate: 566	Bromide: 1.4 Chloride: 395 J Fluoride: 0.72 Sulfate: 39.0 J	Total Dissolved Solids: 1300	ND	TOC Test 2: 18 Total Organic Carbon: 19 J

Notes:

mg/L = Milligrams per liter

ND = Not detected

J = Value estimated at reported concentration

TABLE 4.12-3  
 SITE 14  
 QUARTER 2  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 ( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
M101-A	108-S14-002	02/11/98	Alkalinity: 494 Bicarbonate: 494	Bromide: 0.88 Chloride: 277 Fluoride: 0.47 Nitrate: 0.12 Phosphate: 0.12 Sulfate: 160	Total Dissolved Solids: 1200

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration

TABLE 4.12-3  
SITE 14  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M101-A	108-S14-003	05/13/98	Alkalinity: 373 Bicarbonate: 373	Bromide: 0.98 Chloride: 221 Phosphate: 0.15 J Sulfate: 48.7 J	Total Dissolved Solids: 1000	Total Sulfide: 1.0 J	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed

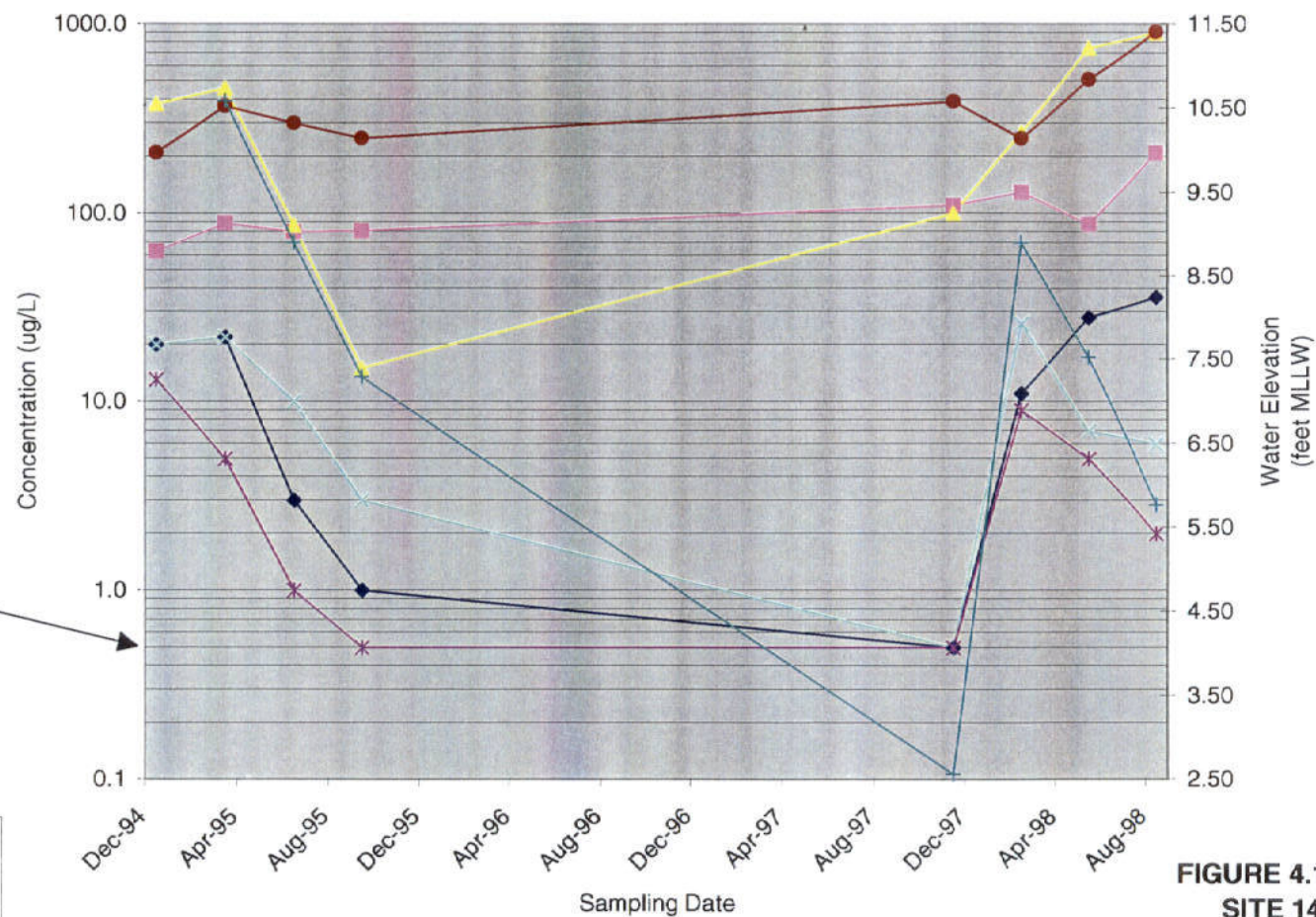
TABLE 4.12-3  
SITE 14  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M101-A	108-S14-004	08/11/98	Alkalinity: 571 Bicarbonate: 571	Bromide: 1.8 J Chloride: 432 J Sulfate: 40.9	Total Dissolved Solids: 1600	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed

ND for  
Trichloroethane,  
Tetrachloroethene, and  
Trichloroethene



**NOTES:**

- ND - Non Detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
- ug/L - Micrograms per liter.
- MLLW - Feet above mean lower low water.

**FIGURE 4.12-1**  
**SITE 14**  
**MONITORING WELL M101-A**  
**TIME SERIES PLOT**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

#### **4.13 SITE 16 – CANS C-2 AREA**

Site 16 is located in the southeastern corner of Alameda Point (Figure 1.2-2). The site is a storage yard and includes an open storage area and a shipping container storage area. The area was formerly used to store solvents and paints; acids and bases; and transformers containing PCB oil. Leaking drums and PCB-oil transformers were reported at the site. Some PCB-contaminated soil was removed from the site in 1982 (PRC and Montgomery Watson 1993c).

Currently, there are four groundwater monitoring wells at Site 16; only one was selected for quarterly sampling. During prior sampling of the Site 16 wells, VOCs were detected in groundwater at the site, but PCBs were not detected. The Site 16 well, M16-04, which was sampled as part of Quarters 1 and 2, was not sampled during Quarters 3 and 4 due to the addition of seven wells to the facility-wide monitoring program and the desire to keep the total number of wells in the program the same.

Table 4.0-1 lists the one groundwater well that was sampled at Site 16 and identifies the parameters by quarter for which the samples were analyzed. The location of this well is shown on Figure 1.2-3.

##### **4.13.1 Sampling Plan Rationale**

Well M16-04 is located along the eastern boundary of Site 16, at the perimeter of Alameda Point and is screened in the FWBZ. Samples from this well were analyzed for VOCs. Data from these analyses was collected to assess groundwater quality associated with Site 16 and along the perimeter of Alameda Point.

Samples from this well were also analyzed for metals and general water quality parameters. Data from these analyses was collected to use in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from this well were analyzed for TOC during the first quarterly sampling event. The TOC data were collected to help evaluate the biodegradation potential for contaminants at this and other sites; a high TOC concentration indicates a high biodegradation potential. Sections 4.13.2 through 4.13.5 present the analytical results for sampling in Quarters 1 and 2.

#### **4.13.2           Quarter 1 Analytical Results**

Organic compounds were not detected during Quarter 1 sampling at concentrations exceeding the MCLs in groundwater from the Site 16 monitoring well (M16-04, screened in the FWBZ). One or more inorganic constituents exceeded the MCLs in groundwater from this well during Quarter 1. This well is shown on Figure 4.1-3, Sheet 1, along with all FWBZ wells with detected inorganic constituents exceeding the MCLs.

Organic analytical results for compounds detected in groundwater samples collected at Site 13 during Quarter 1 are presented on Table 4.13-1. No VOCs were detected in well M16-04.

Table 4.13-2 presents the inorganic constituents detected in groundwater sampled from Site 16. Four metals were detected in the original and duplicate sample from well M16-04; the detected metals include barium, cadmium, manganese, and zinc.

Well M16-04 was analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. This well was also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.13-3.

#### **4.13.3           Quarter 2 Analytical Results**

Organic compounds were not detected during Quarter 2 sampling in groundwater from the Site 16 monitoring well (M16-04, screened in the FWBZ). Inorganic constituents also did not exceed the MCLs in groundwater from this well during Quarter 2.

Organic analytical compounds were not detected in groundwater samples collected at Site 16 during Quarter 2, as shown on Table 4.13-1. No VOCs were detected in the original or duplicate sample from well M16-04.

Table 4.13-2 presents the inorganic constituents detected in groundwater sampled from Site 16. Five metals were detected in the original sample and four metals were detected in the duplicate sample from well M16-04; the detected metals were arsenic, barium, cadmium, manganese, and molybdenum.

Well M16-04 was also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, alkalinity. The results are presented on Table 4.13-3.



TABLE 4.13-1  
SITE 16  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M16-04	108-S16-001	11/11/97	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M16-04	108-S16-002*	11/11/97	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
\* = Duplicate sample

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.13-1  
SITE 16  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
M16-04	108-S16-003	02/06/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M16-04	108-S16-004	02/06/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.13-2  
SITE 16  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
M16-04	108-S16-001	11/11/97	<0.65	<7.1	40.6J	<0.15	4.3	<0.30	<0.40	<0.65	<0.65	41.5	<0.10	<1.0	<0.90	<1.0	<0.35	<0.90	<1.0	3.5J
M16-04	108-S16-002*	11/11/97	<0.65	<7.0	42.8J	<0.15	4.5	<0.30	<0.40	<0.65	<0.65	42.0	<0.10	<1.3	<0.77	<1.0	<0.35	<0.90	<1.0	1.8J

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

\* = Duplicate sample

TABLE 4.13-2  
SITE 16  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			( $\mu\text{g/L}$ )																	
M16-04	108-S16-003	02/06/98	<0.70	4.3J	41.0J	<0.10	0.30J	<0.70	<0.25	<3.4	<0.60	25.0	<0.10	0.82J	<0.62	<0.80	<0.15	<1.4	<1.1	<5.8
M16-04	108-S16-004	02/06/98	<0.70	3.8J	38.3J	<0.10	<0.20	<0.68	<0.25	<0.35	<0.60	24.8	<0.10	1.1J	<0.30	<0.80	<0.15	<1.4	<1.1	<2.2

Notes:  
 $\mu\text{g/L}$  = Micrograms per liter  
 J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.13-3  
 SITE 16  
 QUARTER 1  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 (Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
M16-04	108-S16-001	11/11/97	Alkalinity: 123 Bicarbonate: 123	Chloride: 6.6 Fluoride: 0.27 Phosphate: 0.19 Sulfate: 18.7	Total Dissolved Solids: 200	ND	TOC Test 2: 1 Total Organic Carbon: 2

Notes:

mg/L = Milligrams per liter

ND = Not detected

TABLE 4.13-3  
 SITE 16  
 QUARTER 2  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 ( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
M16-04	108-S16-003	02/06/98	Alkalinity: 94.6 Bicarbonate: 94.6	Chloride: 7.1 Fluoride: 0.17 Nitrate: 0.27 Phosphate: 0.27 Sulfate: 18.8	Total Dissolved Solids: 12

Notes:

mg/L

= Milligram per liter

J.

= Value estimated at reported concentration

Site 22 is located in the southeast portion of Alameda Point, near the base perimeter (Figure 1.2-2). The site was a fuel station with five USTs, three of which contained motor vehicle fuel. The two remaining tanks contained waste oil; the waste oil, however was not suspected to contain PCBs. One of the fuel tanks was reportedly ruptured by a tank measuring rod in 1980 (PRC and Montgomery Watson 1993c).

Currently, there are five active groundwater monitoring wells at Site 22, four of which were selected for quarterly sampling. During prior sampling of these wells, petroleum hydrocarbons (including VOCs) associated with the UST release were detected in groundwater samples. Well M07C-07 was sampled during Quarters 1 and 2, but was not sampled during Quarters 3 and 4 due to the addition of seven wells to the facility-wide monitoring program and the desire to keep the total number of wells in the program the same.

Table 4.0-1 lists the four Quarter 1 and 2 groundwater wells and the three Quarter 3 and 4 wells that were sampled at Site 22 and identifies the parameters for which the samples were analyzed, by quarter. The locations of these wells are shown on Figure 1.2-3.

#### 4.14.1 Sampling Plan Rationale

Well MW547-4 is located in the part of the petroleum hydrocarbon plume exhibiting the highest concentrations compared to groundwater samples from the surrounding monitoring wells. The three remaining wells that were sampled at the site are located near the downgradient margins of the plume, which is migrating to the east. All four wells are screened in the FWBZ. Data from these wells were collected to evaluate the migration of the plume originating at Site 22, and petroleum hydrocarbons originating at Site 13.

Samples from each of the four wells were analyzed for VOCs, TPH, and TEPH. Data from the VOC and petroleum hydrocarbon analyses was collected to assess the migration of the petroleum hydrocarbon plume at the site.

Samples from each of the four wells were analyzed for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from each of the wells were also analyzed for TOC during the first quarterly sampling event. The TOC data were collected to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential. Sections 4.14.2 through 4.14.5 present the analytical results for each quarter of sampling.

#### **4.14.2           Quarter 1 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one Site 22 monitoring well (M07C-08, screened in the FWBZ) during Quarter 1 sampling. This well is shown on Figure 4.1-1, Sheet 1, along with the FWBZ wells from various sites with detected organic compounds exceeding the MCLs. Inorganic constituents exceeded the MCLs in all four Site 22 wells (M07C-07, M07C-08, and MW547-4, screened in the FWBZ and D07C-01, screened in the SWBZ) during Quarter 1 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1, and 4.1-4, Sheet 1, respectively.

Organic analytical results for compounds detected in groundwater samples collected at Site 22 during Quarter 1, are presented in Table 4.14-1. VOCs were detected in one well, M07C-08. The VOCs 1,2-DCB and TCE were detected at concentrations of 3  $\mu\text{g/L}$  and 20  $\mu\text{g/L}$ , respectively.

Groundwater samples from all four Site 22 wells were analyzed for TEPH and TPPH. Although well M07C-08 was not scheduled to have TPPH and TEPH analyses, a sample was inadvertently submitted and analysis performed. Diesel was detected in well MW547-4 at a concentration 0.4 mg/L. No petroleum hydrocarbons were detected in the three wells located near the downgradient margins of the plume.

Ten metals were detected in one or more groundwater samples from the four Site 22 monitoring wells analyzed for metals during Quarter 1. Detected concentrations of arsenic (in three wells), barium (in four wells), cadmium (in four wells), cobalt (in four wells), copper (in two wells), manganese (in four wells), molybdenum (in 1 well), nickel (in 4 wells), selenium (in 1 well), and zinc (in 4 wells) are shown in Table 4.14-2.



All four Site 22 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. All four wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.14-3.

#### **4.14.3 Quarter 2 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one Site 22 monitoring well (MW547-4, screened in the FWBZ) during Quarter 2 sampling. This well is shown on Figure 4.1-1, Sheet 2. Inorganic constituents exceeded the MCLs in three of four Site 22 wells (M07C-07 and MW547-4, screened in the FWBZ and D07C-01, screened in the SWBZ) during Quarter 2 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 2, and 4.1-4, Sheet 2, respectively.

Organic analytical results for compounds detected in groundwater samples collected during Quarter 2 at Site 22, are presented in Table 4.14-1. VOCs were detected in one well, MW547-4. The BTEX compounds benzene, ethylbenzene, and total xylenes were detected in this well at concentrations of 13  $\mu\text{g/L}$ , 7  $\mu\text{g/L}$ , and 1  $\mu\text{g/L}$ , respectively.

Groundwater samples from all four Site 22 wells were analyzed for TEPH and TPPH. Diesel, motor oil, and gasoline were detected in well MW547-4 at concentrations of 0.49 mg/L, 0.66 mg/L and 0.55 mg/L, respectively. No petroleum hydrocarbons were detected in the other three Site 22 wells.

Eleven metals were detected in one or more groundwater samples from the four Site 22 monitoring wells analyzed for metals during Quarter 2. Detected concentrations of arsenic (in three wells), barium (in all four wells), cadmium (in two wells), cobalt (in one well), copper (in one well), lead (in one well), manganese (in three wells), molybdenum (in one well), nickel (in all four wells), silver (in one well), and zinc (in two wells) are shown in Table 4.14-2.

All four Site 22 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.14-3.

#### **4.14.4 Quarter 3 Analytical Results**

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one of three Site 22 monitoring wells (MW547-4, screened in the FWBZ) sampled during Quarter 3. This well is shown on Figure 4.1-1, Sheet 3. Inorganic constituents exceeded the MCLs in all three Site 22 wells during Quarter 3 sampling (M07C-08 and MW547-4, screened in the FWBZ and D07C-01, screened in the SWBZ). The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 3, and 4.1-4, Sheet 3, respectively.

Organic analytical results for compounds detected in groundwater samples collected during Quarter 3 at Site 22, are presented in Table 4.14-1. VOCs were detected in one well, MW547-4. BTEX compounds benzene and ethylbenzene were detected in this well at concentrations of 12  $\mu\text{g/L}$  and 3  $\mu\text{g/L}$ , respectively. VOCs were not detected in the other two wells.

Groundwater samples from two Site 22 wells were analyzed for TEPH and TPPH. Diesel and gasoline were detected in well MW547-4 at concentrations of 0.48 mg/L and 0.63 mg/L, respectively. Petroleum hydrocarbons were not detected in well M07C-08.

Twelve metals were detected in one or more groundwater samples from the three Site 22 monitoring wells analyzed for metals during Quarter 3. Detected concentrations of antimony (in one well), arsenic (in two wells), barium (in all three wells), cadmium (in two wells), chromium (in two wells), cobalt (in all three wells), copper (in two wells), manganese (in all three wells), molybdenum (in two wells), nickel (in all three wells), vanadium (in one well), and zinc (in two wells) are shown in Table 4.14-2.

All four Site 22 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.14-3.

#### **4.14.5 Quarter 4 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the three Site 22 monitoring wells sampled during Quarter 4. Inorganic constituents were detected at concentrations exceeding the MCLs in two of three Site 22 wells sampled during Quarter 4 (MW547-4, screened in the FWBZ and D07C-01, screened in the SWBZ). The FWBZ and SWBZ wells with

detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 4 and 4.1-4, Sheet 4, respectively.

Organic analytical results for compounds detected in groundwater samples collected during Quarter 4 at Site 22, are presented in Table 4.14-1. VOCs were not detected during Quarter 4 sampling. Groundwater samples from two Site 22 wells were analyzed for TEPH and TPPH. Diesel and gasoline were detected in well MW547-4 at concentrations of 0.42 mg/L and 0.31 mg/L, respectively. Petroleum hydrocarbons were not detected in well M07C-08.

Nine metals were detected in one or more groundwater samples from the three Site 22 monitoring wells analyzed for metals during Quarter 4. Detected concentrations of antimony (in one well), arsenic (in one well), barium (in all three wells), cobalt (in two wells), manganese (in all three wells), molybdenum (in one well), nickel (in one well), vanadium (in two wells), and zinc (in one well) are shown in Table 4.14-2.

All four Site 22 wells were analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.14-3.

#### **4.14.6 Time-Series Plots**

In order to track the progression of chemical degradation and movement in groundwater at Site 22, changes in chemical concentration were followed over a period from 1994 through 1998. A time-series plot (Figure 4.14-1) was prepared for one monitoring well (MW547-4) at Site 22, located within an extremely small petroleum contaminant plume depicted in Figures 6-5 and 6-6. Petroleum concentrations within monitoring well MW547-4 have generally remained the same over the four year time frame, increasing during periods of precipitation and decreasing during the dry summer months. This behavior suggests that residual petroleum products may have been flushed from the overlying soil or capillary fringe in response to infiltrating rainwater. However, no substantive increases in the concentration of benzene was observed.

TABLE 4.14-1  
SITE 22  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07C-01	108-S22-003	11/11/97	ACETONE: R	NA	NA	ND	NA
M07C-07	108-S22-001	11/07/97	ACETONE: R	NA	NA	ND	NA
M07C-08	108-S22-002	11/07/97	1,2-DICHLOROBENZENE: 3J ACETONE: R TRICHLOROETHENE: 20J	NA	NA	ND	NA
MW547-4	108-S22-004	11/10/97	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.4J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected

TABLE 4.14-1  
SITE 22  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (ng/L)	OIL AND GREASE (ng/L)
D07C-01	108-S22-005	02/04/98	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
M07C-07	108-S22-006	02/11/98	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
M07C-08	108-S22-007	02/11/98	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
MW547-4	108-S22-008	02/11/98	2-BUTANONE: R ACETONE: R BENZENE: 13 ETHYLBENZENE: 7 XYLENE (TOTAL): 1	NA	NA	DIESEL RANGE ORGANICS: 0.49J MOTOR OIL RANGE ORGANICS: 0.66J GASOLINE RANGE ORGANICS: 0.55J	NA

Notes:

µg/L = Micrograms per liter  
ng/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected

TABLE 4.14-1  
SITE 22  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07C-01	108-S22-009	05/14/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
M07C-08	108-S22-011	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	ND	NA
MWS47-4	108-S22-012	05/13/98	2-BUTANONE: R ACETONE: R BENZENE: 12J ETHYLBENZENE: 3	NA	NA	DIESEL RANGE ORGANICS: 0.48J GASOLINE RANGE ORGANICS: 0.63J	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	ND = Not detected
R = Rejected	

TABLE 4.14-1  
SITE 22  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D07C-01	108-S22-013	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
M07-08	108-S22-014	08/11/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	ND	NA
MWS47-4	108-S22-015	08/11/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.42J GASOLINE RANGE ORGANICS: 0.31J	NA

Notes:

µg/L = Micrograms per liter

mg/L = Milligrams per liter

NA = Not analyzed

R = Rejected

PCBs = Polychlorinated biphenyls

J = Value estimated at reported concentration

ND = Not detected

TABLE 4.14-2  
SITE 22  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D07C-01	108-S22-003	11/11/97	<1.6	<1.0	118	<0.15	0.42J	<0.30	1.7J	<0.65	<0.65	798	<0.10	<0.94	8.5	<1.0	<0.35	<0.90	<2.6	10.5
M07C-07	108-S22-001	11/07/97	<2.8	4.6J	99.2J	<0.15	0.20J	<0.30	1.6J	1.4J	<0.65	1540	<0.10	<2.0	10.3	<1.0	<0.35	<0.90	<1.4	14.3
M07C-08	108-S22-002	11/07/97	<2.8	2.6J	140	<0.15	0.18J	<0.84	1.6J	9.8	<0.65	579	<0.10	8.1	20.5	<1.0	<0.35	<0.90	<6.7	17.5
MW547-4	108-S22-004	11/10/97	<0.90	35.7	174	<0.15	0.33J	<1.1	0.44J	<0.65	<0.65	3850	<0.10	<4.6	3.1J	1.6J	<0.77	<0.90	<0.90	9.7J

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit



TABLE 4.14-2  
SITE 22  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D07C-01	108-S22-005	02/04/98	<0.70	<0.80	104	<0.10	0.36J	<0.20	1.5J	<0.60	<0.60	514	<0.10	0.30J	6.0J	<1.1	<0.15	<1.3	<2.3	<5.5
M07C-07	108-S22-006	02/11/98	<2.8	10.2	90.3J	<0.10	0.78J	<0.20	<0.26	<9.4	<1.2	74.2	<0.10	<1.2	5.9J	<1.8	<0.15	<1.4	<0.82	9.5J
M07C-08	108-S22-007	02/11/98	<2.7	3.9J	62.3J	<0.10	<0.20	<1.9	<0.26	25.1	<0.62	<3.9	<0.10	<3.3	28.8	<1.8	<0.15	<1.4	<7.0	11.2
MW547-4	108-S22-008	02/11/98	<0.70	18.1	186	<0.10	<0.20	<0.45	<0.50	<0.35	<1.1	3360	<0.10	<1.9	1.3J	<1.8	0.21J	<1.4	<0.43	<1.4

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.14-2  
SITE 22  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I O M	Z I N C
			(µg/L)																	
D07C-01	108-S22-009	05/14/98	<0.85	<1.0	353	<0.10	0.22J	<0.35	1.6J	2.8J	<0.50	774	<0.10	<0.55	4.2J	R	<0.30	<1.4	<3.1	105
M07C-08	108-S22-011	05/13/98	1.9J	3.8J	256	<0.10	1.7J	9.5	1.3J	19.1J	<2.2	141	<0.10	3.0J	29.4	R	<0.30	<1.4	12.4J	90.7
MW547-4	108-S22-012	05/13/98	<0.85	20.9	200	<0.10	<0.32	1.7J	0.54J	<2.1	<3.6	3230	<0.10	2.3J	2.6J	R	<0.30	<1.4	<1.9	<11.4

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
 R = Rejected

TABLE 4.14-2  
SITE 22  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D07C-01	108-S22-013	08/07/98	<2.0	<2.8	99.7J	<0.20	<0.30	<0.80	<0.40	<2.2	<1.7	129	<0.10	1.0J	<4.0	<2.2	<0.70	<1.1	1.9J	<5.8
M07-08	108-S22-014	08/11/98	2.5J	<3.2	79.2J	<0.20	<0.30	<0.80	4.4J	<14.4	<1.7	272	<0.10	<4.5	21.5	<2.2	<0.70	<1.1	9.9J	9.5J
MW547-4	108-S22-015	08/11/98	<1.8	22.7	169J	<0.20	<0.30	<0.80	2.2J	<3.4	<1.7	3610	<0.10	<2.2	<1.6	<2.2	<0.70	<1.1	<1.0	<6.9

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.14-3  
SITE 22  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07C-01	108-S22-003	11/11/97	Alkalinity: 382 Bicarbonate: 382	Bromide: 2.3 Chloride: 402 Nitrate-N: 4.9 Sulfate: 147	Total Dissolved Solids: 1200	ND	ND
M07C-07	108-S22-001	11/07/97	Alkalinity: 483 Bicarbonate: 483	Chloride: 132 J Fluoride: 0.74 Sulfate: 78.6 J	Total Dissolved Solids: 620	ND	TOC Test 2: 19 Total Organic Carbon: 19 J
M07C-08	108-S22-002	11/07/97	Alkalinity: 342 Bicarbonate: 342	Bromide: 0.42 Chloride: 12.9 J Fluoride: 0.41 Phosphate: 1.0 Sulfate: 16.0 J	Total Dissolved Solids: 360	ND	TOC Test 2: 14 Total Organic Carbon: 15 J
MW547-4	108-S22-004	11/10/97	Alkalinity: 590 Bicarbonate: 590	Bromide: 5.1 Chloride: 1320 Sulfate: 55.0	Total Dissolved Solids: 650	Total Sulfide: 2 J	TOC Test 2: 10 Total Organic Carbon: 10

Notes:

mg/L = Milligrams per liter

ND = Not detected

J = Value estimated at reported concentration

TABLE 4.14-3  
SITE 22  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
D07C-01	108-S22-005	02/04/98	Alkalinity: 382 Bicarbonate: 382	Bromide: 1.8 Chloride: 349 Fluoride: 0.11 Nitrate: 4.8 Sulfate: 132	Total Dissolved Solids: 1200
M07C-07	108-S22-006	02/11/98	Alkalinity: 484 Bicarbonate: 484	Bromide: 0.47 Chloride: 111 Fluoride: 0.23 Sulfate: 50.9	Total Dissolved Solids: 650
M07C-08	108-S22-007	02/11/98	Alkalinity: 119 Bicarbonate: 119	Bromide: 0.13 Chloride: 5 Fluoride: 0.14 Nitrate: 0.2 Phosphate: 1.8 Sulfate: 3.1	Total Dissolved Solids: 180
MW547-4	108-S22-008	02/11/98	Alkalinity: 581 Bicarbonate: 581	Bromide: 0.42 Chloride: 11.9 Fluoride: 0.27 Nitrite: 0.11 Sulfate: 3.3	Total Dissolved Solids: 150

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration

TABLE 4.14-3  
SITE 22  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07C-01	108-S22-009	05/14/98	Alkalinity: 373 Bicarbonate: 373	Bromide: 0.92 Chloride: 392 Nitrate-N: 1.9 Sulfate: 155	Total Dissolved Solids: 1400	ND	ND
M07C-08	108-S22-011	05/13/98	Alkalinity: 123 Bicarbonate: 123	Bromide: 0.16 Chloride: 7.3 Fluoride: 0.16 J Nitrate-N: 0.96 Phosphate: 1.5 J Sulfate: 9.9 J	Total Dissolved Solids: 360	Total Sulfide: 1 J	NA
MW547-4	108-S22-012	05/13/98	Alkalinity: 554 Bicarbonate: 554	Bromide: 0.37 Chloride: 9.7 Sulfate: 5.8 J	Total Dissolved Solids: 780	Total Sulfide: 1.3 J	NA

Notes:

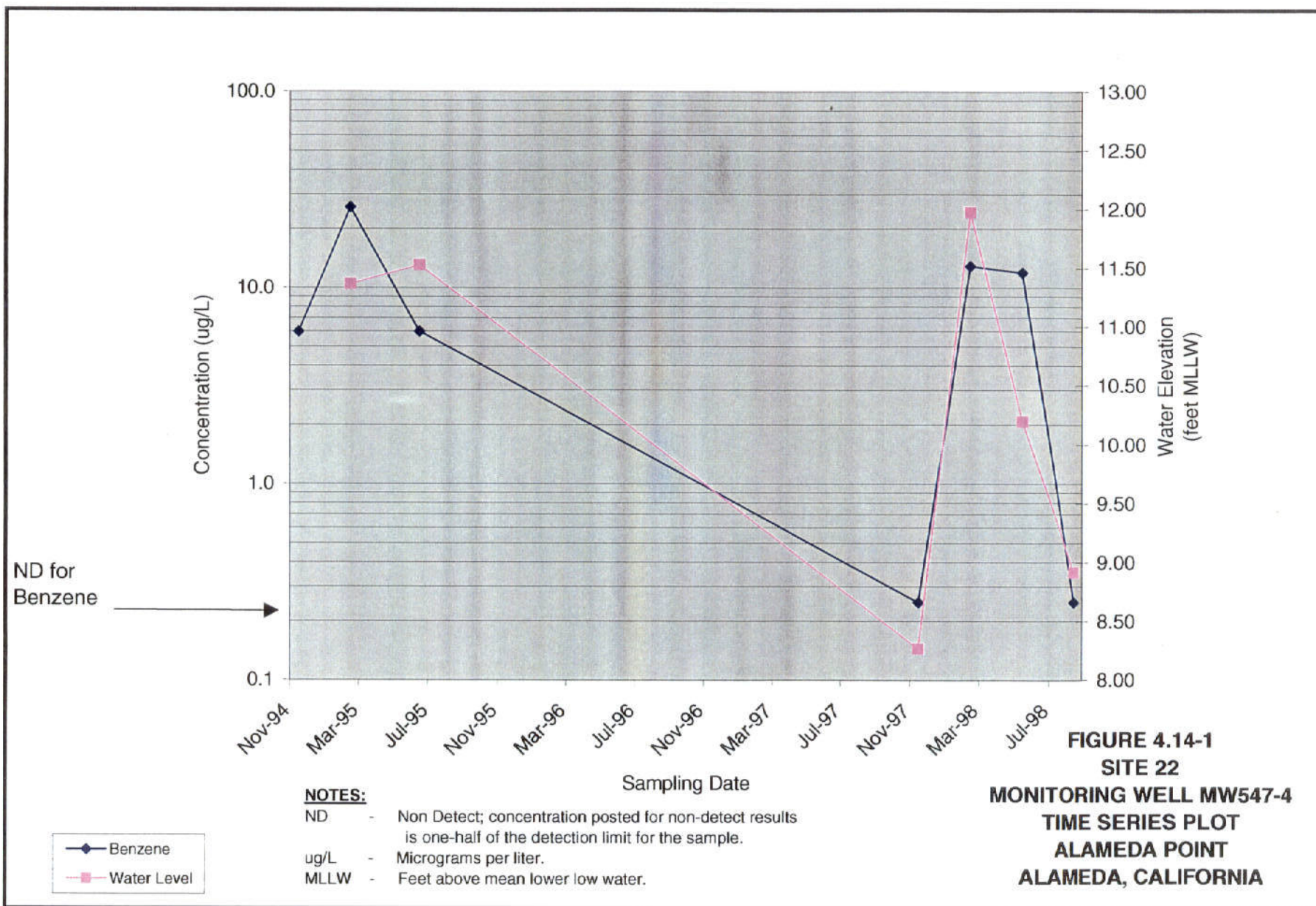
J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected

TABLE 4.14-3  
SITE 22  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D07C-01	108-S22-013	08/07/98	Alkalinity: 390 Bicarbonate: 390	Bromide: 2.2 Chloride: 298 Nitrate-N: 4.9 Sulfate: 151	Total Dissolved Solids: 1300	ND	ND
M07C-08	108-S22-014	08/11/98	Alkalinity: 182 Bicarbonate: 182	Chloride: 8.6 J Phosphate: 1.2 Sulfate: 11.8	Total Dissolved Solids: 330	ND	NA
MW547-4	108-S22-015	08/11/98	Alkalinity: 671 Bicarbonate: 671	Bromide: 0.51 J Chloride: 12.1 J	Total Dissolved Solids: 770	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected





Site 23 is located in the southeastern portion of Alameda Point (Figure 1.2-2). Building 530, located on the site, was used as a missile rework facility beginning in 1972. Solvents and paint wastes were used and stored at the site (PRC and Montgomery Watson 1993c).

Currently, there are six groundwater monitoring wells at Site 23, two of which were selected for quarterly sampling. During prior sampling of these wells (MW530-2 and D10B-02), solvents were detected in groundwater at the site.

Table 4.0-1 lists the two groundwater wells that were sampled at Site 23 and identifies the parameters by quarter for which the samples were analyzed. The locations of these wells are shown on Figure 1.2-3.

#### 4.15.1 Sampling Plan Rationale

Wells MW530-2 is screened in the FWBZ and well D10B-02 is screened in the SWBZ. Samples from these wells were analyzed for VOCs. The VOC data were collected to monitor solvent concentrations at the site.

Samples from both wells were also analyzed for metals and general water quality parameters. Data from these analyses were collected to prepare a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point.

Samples from one well (MW530-2) were also analyzed for TPPH and TEPH to evaluate the southern extent of the petroleum hydrocarbons originating at nearby Site 13.

Samples from each of the wells were analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential. Sections 4.15.2 through 4.15.5 present the analytical results for each quarter of sampling.

#### **4.15.2 Quarter 1 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the two Site 23 monitoring wells during Quarter 1 sampling. The FWBZ wells from various sites with detected organic compounds exceeding the MCLs are shown on Figure 4.1-1, Sheet 1. Inorganic constituents exceeded the MCLs in both Site 23 wells (MW530-2, screened in the FWBZ and D10B-02, screened in the SWBZ) during Quarter 1 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1, and 4.1-4, Sheet 1, respectively.

Table 4.15-1 presents the organic compounds detected in groundwater samples collected at Site 23 during Quarter 1. No VOCs were detected in samples from wells D10B-02 or M530-2. Groundwater samples from well MW530-2 were analyzed for TPPH and TEPH. Diesel was detected in this well at a concentration of 1 mg/L.

Eight metals were detected in one or more groundwater samples from the two Site 23 monitoring wells analyzed for metals during Quarter 1. Detected concentrations of arsenic (in one well), barium (in both wells), cadmium (in one well), cobalt (in one well), copper (in one well), manganese (in both wells), nickel (in one well), and zinc (in both wells) are shown in Table 4.15-2.

Both Site 23 wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. Both wells were also analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.15-3.

#### **4.15.3 Quarter 2 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the two Site 23 monitoring wells during Quarter 2 sampling. Inorganic constituents exceeded the MCLs in both Site 23 wells (MW530-2, screened in the FWBZ and D10B-02, screened in the SWBZ) during Quarter 2 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 2, and 4.1-4, Sheet 2, respectively.

Table 4.15-1 presents the organic compounds detected in groundwater samples collected at Site 23 during Quarter 2. No VOCs were detected in samples from wells D10B-02 or M530-2. Groundwater samples

from well MW530-2 were analyzed for TPPH and TEPH. Diesel and motor oil were detected in this well at concentrations of 0.54 and 0.30 mg/L, respectively.

Five metals were detected in one or more groundwater samples from the two Site 23 monitoring wells analyzed for metals during Quarter 2. Detected concentrations of arsenic (in one well), barium (in both wells), cadmium (in one well), manganese (in both wells), and molybdenum (in one well) are shown in Table 4.15-2.

Both Site 23 wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.15-3.

#### **4.15.4 Quarter 3 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the two Site 23 monitoring wells during Quarter 3 sampling. Inorganic constituents exceeded the MCLs in both Site 23 wells (MW530-2, screened in the FWBZ and D10B-02, screened in the SWBZ) during Quarter 3 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 3, and 4.1-4, Sheet 3, respectively.

Table 4.15-1 presents the organic compounds detected in groundwater samples collected at Site 23 during Quarter 3. No VOCs were detected in samples from wells D10B-02 or M530-2. Groundwater samples from well MW530-2 were analyzed for TPPH and TEPH. Diesel and gasoline were detected in this well at concentrations of 0.40 and 0.036 mg/L, respectively.

Nine metals were detected in one or more groundwater samples from the two Site 23 monitoring wells analyzed for metals during Quarter 3. Detected concentrations of arsenic (in one well), barium (in both wells), chromium (in one well), cobalt (in one well), manganese (in both wells), molybdenum (in both wells), nickel (in both wells), vanadium (in one well), and zinc (in both wells) are shown in Table 4.15-2.

Both Site 23 wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.15-3.

#### 4.15.5 Quarter 4 Analytical Results

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the two Site 23 monitoring wells during Quarter 4 sampling. Inorganic constituents exceeded the MCLs in both Site 23 wells (MW530-2, screened in the FWBZ and D10B-02, screened in the SWBZ) during Quarter 4 sampling. The FWBZ and SWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 4, and 4.1-4, Sheet 4, respectively.

Table 4.15-1 presents the organic compounds detected in groundwater samples collected at Site 23 during Quarter 4. No VOCs were detected in samples from wells D10B-02 or M530-2. Groundwater samples from well MW530-2 were analyzed for TPPH and TEPH. Diesel and motor oil were detected in this well at concentrations of 0.76 mg/L and 0.47 mg/L, respectively.

Eight metals were detected in one or more groundwater samples from the two Site 23 monitoring wells analyzed for metals during Quarter 4. Detected concentrations of barium (in both wells), cadmium (in one well), chromium (in one well), cobalt (in one well), manganese (in both wells), molybdenum (in one well), vanadium (in one well), and zinc (in one well) are shown in Table 4.15-2.

Both Site 23 wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.15-3.

TABLE 4.15-1  
SITE 23  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D10B-02	108-S23-001	11/13/97	2-BUTANONE: R	NA	NA	NA	NA
M530-2	108-S23-002	11/06/97	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 1J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.15-1  
SITE 23  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D10B-02	108-S23-003	02/12/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
MW530-2	108-S23-004	02/06/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.54J MOTOR OIL RANGE ORGANICS: 0.30J	NA

Notes:

µg/L = Micrograms per liter

mg/L = Milligrams per liter

NA = Not analyzed

PCBs = Polychlorinated biphenyls

J = Value estimated at reported concentration

R = Rejected

TABLE 4.15-1  
SITE 23  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D10B-02	108-S23-005	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	NA	NA
MW530-2	108-S23-006	05/13/98	2-BUTANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.40J GASOLINE RANGE ORGANICS: 0.036J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected

TABLE 4.15-1  
SITE 23  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
D10B-02	108-S23-007	08/07/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	NA	NA
MW530-2	108-S23-008	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	NA	NA	DIESEL RANGE ORGANICS: 0.76J MOTOR OIL RANGE ORGANICS: 0.47J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
R = Rejected



TABLE 4.15-2  
SITE 23  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
D10B-02	108-S23-001	11/13/97	<1.1	<2.2	90.5J	<0.15	0.16J	<0.30	<0.40	<0.65	<0.65	394	<0.10	<1.3	4.0J	<1.0	<0.35	<0.90	<0.40	6.0J
M530-2	108-S23-002	11/06/97	<1.8	8.9	53.0J	<0.15	<0.15	<0.56	0.42J	0.66J	<0.65	53.1	<0.10	<2.9	<3.0	<1.0	<0.35	<0.90	<3.5	9.2J

Notes:

$\mu\text{g/L}$  = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.15-2  
SITE 23  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
D10B-02	108-S23-003	02/12/98	<0.70	<0.80	80.2J	<0.10	0.33J	<0.20	<0.36	<0.35	<0.60	401	<0.10	<0.64	<1.5	<9.0	<0.15	<1.4	<0.30	<3.3
MW530-2	108-S23-004	02/06/98	<0.70	7.0	67.2J	<0.10	<0.20	<1.0	<0.68	<0.35	<0.60	121	<0.10	2.8J	<3.0	<0.80	<0.15	<1.4	<3.5	<4.1

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.15-2  
SITE 23  
QUARTER 3  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
D10B-02	108-S23-005	05/13/98	<0.85	<1.1	310	<0.10	<0.16	<0.35	<0.30	<3.6	<0.50	456	<0.10	0.62J	1.5J	R	<0.30	<1.4	<0.25	104
MW530-2	108-S23-006	05/13/98	<0.85	6.5	312	<0.10	<0.15	3.0J	0.54J	<5.0	<0.76	64.6	<0.10	3.7J	4.5J	R	<0.30	<1.4	6.3J	94.3

Notes:  
 µg/L = Micrograms per liter  
 J = Value estimated at reported concentration  
 < = Parameter reported below reporting limit  
 R = Rejected

TABLE 4.15-2  
SITE 23  
QUARTER 4  
INORGANIC COMPOUNDS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			( $\mu\text{g/L}$ )																	
D10B-02	108-S23-007	08/07/98	<3.4	<2.1	59.2J	<0.20	0.35J	2.7J	<2.4	<1.7	<1.7	388	<0.10	2.3J	<2.5	<2.2	<0.70	<1.1	4.4J	8.6J
MW530-2	108-S23-008	08/10/98	<1.8	<11.5	39.4J	<0.20	<0.30	<0.80	2.7J	<2.5	23.9	81.4	<0.10	<4.0	<2.2	<2.2	<0.70	<1.1	<3.8	<7.4

Notes:

$\mu\text{g/L}$  = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.15-3  
SITE 23  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D10B-02	108-S23-001	11/13/97	Alkalinity: 135 Bicarbonate: 135	Bromide: 13.0 Chloride: 2520 Sulfate: 489	Total Dissolved Solids: 5900	ND	ND
M530-2	108-S23-002	11/06/97	Alkalinity: 478 Bicarbonate: 478	Bromide: 0.75 Chloride: 178 Fluoride: 1.8 Phosphate: 2.8 Sulfate: 71.1	Total Dissolved Solids: 920	ND	TOC Test 2: 17 Total Organic Carbon 16 J

Notes:

mg/L = Milligrams per liter

ND = Not detected

J = Value estimated at reported concentration

TABLE 4.15-3  
 SITE 23  
 QUARTER 2  
 GENERAL CHEMICALS DETECTED IN GROUNDWATER  
 ALAMEDA POINT  
 ( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)		Anions (mg/L)		Total Dissolved Solids (mg/L)
D10B-02	108-S23-003	02/12/98	Alkalinity:	149	Bromide:	11.8	Total Dissolved Solids: 4900
			Bicarbonate:	149	Chloride:	2540	
					Sulfate:	417	
MW530-2	108-S23-004	02/06/98	Alkalinity:	424	Bromide:	0.61	Total Dissolved Solids: 150
			Bicarbonate:	424	Chloride:	180	
					Fluoride:	0.86	
					Nitrate:	0.66	
					Phosphate:	0.92	
					Sulfate:	48	

Notes:

mg/L

= Milligram per liter

J

= Value estimated at reported concentration

TABLE 4.15-3  
SITE 23  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D10B-02	108-S23-005	05/13/98	Alkalinity: 190 Bicarbonate: 190	Bromide: 7 Chloride: 2790 Nitrate-N: 2 Sulfate: 427 J	Total Dissolved Solids: 5400	Total Sulfide: 1.0 J	NA
M530-2	108-S23-006	05/13/98	Alkalinity: 373 Bicarbonate: 373	Bromide: 0.2 Chloride: 58.1 Fluoride: 1.1 J Nitrate-N: 0.82 Phosphate: 0.67 J Sulfate: 43.8 J	Total Dissolved Solids: 920	Total Sulfide: 1.1 J	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed

TABLE 4.15-3  
SITE 23  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
D10B-02	108-S23-007	08/07/98	Alkalinity: 145 Bicarbonate: 145	Bromide: 7.2 Chloride: 1580 Nitrate-N: 0.71 Sulfate: 312	Total Dissolved Solids: 3500	ND	NA
MW530-2	108-S23-008	08/10/98	Alkalinity: 435 Bicarbonate: 435	Bromide: 1.1 J Chloride: 273 J Fluoride: 1.6 J Phosphate: 3.3 Sulfate: 42.4	Total Dissolved Solids: 1200	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed



Four groundwater monitoring wells have been installed at Alameda Point to provide background water quality data. These wells (MBG-1 through MBG-4) are located near the eastern and northeastern perimeters of the base (Figure 1.2-3).

Table 4.0-1 lists the four background groundwater wells that were sampled and identifies the parameters for which the well samples were analyzed, by quarter.

#### 4.16.1 Sampling Plan Rationale

Each of the four background monitoring wells is screened in the FWBZ and was sampled on a quarterly basis. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, general water quality parameters, TPH, TEPH, and TOC. The data from these analyses is being used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at Alameda Point. Sections 4.16.2 through 4.16.5 present the analytical results for each quarter of sampling.

#### 4.16.2 Quarter 1 Analytical Results

One or more organic compounds were detected at concentrations exceeding the MCLs in groundwater from one background monitoring well during Quarter 1 sampling (MBG-1, screened in the FWBZ). This well is shown on Figure 4.1-1, Sheet 1, along with the FWBZ wells from various sites with detected organic compounds exceeding the MCLs. Inorganic constituents exceeded the MCLs in three of the four background wells during Quarter 1 sampling (MBG-1, MBG-2, and MBG-3); these three wells are screened in the FWBZ. FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 1.

Organic analytical results for compounds detected in groundwater samples collected from the background wells during Quarter 1 are presented on Table 4.16-1. VOCs were detected in three of the four background wells. Vinyl chloride was detected in MBG-1. The highest VOC concentrations detected in background wells were in well MBG-3; benzene and xylene were detected at 0.5  $\mu\text{g/L}$  and 6  $\mu\text{g/L}$ , respectively. Chloroform was detected in groundwater from MBG-4.

SVOCs were detected in two wells, MBG-1 and MBG-2. Pyrene was detected in both wells. In addition, acenaphthene, fluoranthene, and phenanthrene were detected in well MBG-2. Pesticides and PCBs were not detected in the four background wells.

Petroleum hydrocarbons were detected in three of the four background wells. Gasoline was detected at relatively low concentrations (compared to concentrations detected in wells at other sites) in wells MBG-1 and MBG-3. Diesel was detected in MBG-2.

Eight metals were detected in one or more groundwater samples from the four background monitoring wells analyzed for metals during Quarter 1. Detected concentrations of arsenic (in three wells), barium (in four wells), chromium (in one well), cobalt (in two wells), copper (in one well), manganese (in four wells), silver (in one well), and vanadium (in one well) are shown in Table 4.16-2.

All four background wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. In addition, all four wells were analyzed for TOC, but only during the first quarter of sampling. The results are presented on Table 4.16-3.

#### **4.16.3 Quarter 2 Analytical Results**

Organic compounds were not detected during Quarter 2 sampling at concentrations exceeding the MCLs in groundwater from the four background monitoring wells. Inorganic constituents exceeded the MCLs in all four background wells (MBG-1, MBG-2, MBG-3, and MBG-4) during Quarter 2 sampling; these three wells are screened in the FWBZ. FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 2.

Organic analytical results for compounds detected in groundwater samples collected from the background wells during Quarter 2 are presented on Table 4.16-1. VOCs were not detected in background wells. SVOCs were detected in two of the wells, including pyrene in MBG-1 and acenaphthene, phenanthrene, and pyrene in MBG-2. The highest SVOC concentration detected in background wells was acenaphthene at a concentration of 10  $\mu\text{g/L}$  in well MBG-2. Similar SVOC results were reported in Quarter 1. No pesticides or PCBs were detected in the background wells.

Petroleum hydrocarbons were detected in two of the four background wells. Gasoline was not detected in the Quarter 2 samples. Diesel was detected in MBG-2 at a concentration of 0.069 mg/L and motor oil was detected in both MBG-2 and MBG-4 at concentrations of 0.19 and 0.40 mg/L, respectively.

Five metals were detected in one or more groundwater samples from the four background monitoring wells during Quarter 2 sampling. Detected concentrations of arsenic (in three wells), barium (in four wells), chromium (in one well), and manganese (in four wells) are shown in Table 4.16-2.

All four background wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.16-3.

#### **4.16.4 Quarter 3 Analytical Results**

Organic compounds were detected at concentrations exceeding the MCLs in groundwater from one of the background monitoring wells during Quarter 3 sampling, as shown on Figure 4.1-1, Sheet 3. Inorganic constituents exceeded the MCLs in all four background wells (MBG-1, MBG-2, MBG-3, and MBG-4, screened in the FWBZ) during Quarter 3 sampling. FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 3.

Organic analytical results for compounds detected in groundwater samples collected from the background wells during Quarter 3 are presented on Table 4.16-1. VOCs were not detected in background wells. SVOCs were detected in two of the wells, including pyrene in MBG-1 and acenaphthene, fluoranthene, phenanthrene, and pyrene in MBG-2. The highest SVOC concentration detected in background wells was acenaphthene at a concentration of 15  $\mu\text{g/L}$  in well MBG-2. Similar SVOC results were reported in Quarters 1 and 2. The pesticide heptachlor epoxide was detected at a low concentration (0.020  $\mu\text{g/L}$ ) in the groundwater from well MBG-2. No PCBs were detected in the background wells.

Petroleum hydrocarbons were detected in one of the background wells (MBG-4). Gasoline was detected in MBG-4 at a concentration of 0.028 mg/L. Diesel and motor oil were not detected in the Quarter 3 samples.

Ten metals were detected in one or more groundwater samples from the four background monitoring wells during Quarter 3 sampling. Detected concentrations of arsenic (in one well), barium (in all four wells), cadmium (in one well), chromium (in all four wells), cobalt (in one well), copper (in all four

wells), manganese (in all four wells), mercury (in one well), nickel (in all four wells), and zinc (in all four wells) are shown in Table 4.16-2.

All four background wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.16-3.

#### **4.16.5 Quarter 4 Analytical Results**

Organic compounds were not detected at concentrations exceeding the MCLs in groundwater from the four background monitoring wells during Quarter 4 sampling. Inorganic constituents exceeded the MCLs in all four background wells (MBG-1, MBG-2, MBG-3, and MBG-4, screened in the FWBZ) during Quarter 4 sampling. FWBZ wells with detected inorganic constituents exceeding the MCLs are shown on Figure 4.1-3, Sheet 4.

Organic analytical results for compounds detected in groundwater samples collected from the background wells during Quarter 4 are presented on Table 4.16-1. VOCs were not detected in background wells. SVOCs were detected in two of the wells, including pyrene in MBG-1 and acenaphthene, anthracene, fluoranthene, naphthalene, phenanthrene, and pyrene in MBG-2. The highest SVOC concentration detected in the background wells was acenaphthene at a concentration of 19  $\mu\text{g/L}$  in well MBG-2. Similar SVOC results were reported in previous quarterly samples. No pesticides or PCBs were detected in the background wells.

Petroleum hydrocarbons were detected in one of the background wells (MBG-2). Diesel and motor oil were detected in MBG-2 at concentrations of 0.13 and 0.25 mg/L, respectively. Gasoline was not detected in the Quarter 4 samples.

Seven metals were detected in one or more groundwater samples from the four background monitoring wells during Quarter 4 sampling. Detected concentrations of barium (in all four wells), chromium (in two wells), cobalt (in three wells), lead (in one well), manganese (in all four wells), mercury (in one well), and zinc (in one well) are shown in Table 4.16-2.

All four background wells were also analyzed for anions, nitrate/nitrite as nitrogen, TDS, sulfide, and alkalinity. The results are presented on Table 4.16-3.

TABLE 4.16-1  
QUARTER 1  
ORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
MBG-1	108-SBG-001	11/05/97	2-BUTANONE: R ACETONE: R VINYL CHLORIDE: 0.6	PYRENE: 2J	ND	GASOLINE RANGE ORGANICS: 0.032J	NA
MBG-2	108-SBG-002	11/05/97	NA	ACENAPHTHENE: 17 FLUORANTHENE: 2J PHENANTHRENE: 2J PYRENE: 4J	ND	DIESEL RANGE ORGANICS: 0.1J	NA
MBG-2	108-SBG-100	11/06/97	2-BUTANONE: R ACETONE: R	NA	ND	ND	NA
MBG-3	108-SBG-003	11/05/97	2-BUTANONE: R BENZENE: 0.5 XYLENE (TOTAL): 6	ND	ND	GASOLINE RANGE ORGANICS: 0.051J	NA
MBG-4	108-SBG-004	11/05/97	2-BUTANONE: R ACETONE: R CHLOROFORM: 3	ND	ND	ND	NA

Notes:

µg/L = Micrograms per liter	PCBs = Polychlorinated biphenyls
mg/L = Milligrams per liter	J = Value estimated at reported concentration
NA = Not analyzed	ND = Not detected
R = Rejected	

TABLE 4.16-1  
QUARTER 2  
ORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
MBG-1	108-SBG-005	02/11/98	2-BUTANONE: R ACETONE: R	PYRENE: 1J	ND	ND	NA
MBG-2	108-SBG-006	02/11/98	2-BUTANONE: R ACETONE: R	ACENAPHTHENE: 10 PHENANTHRENE: 2J PYRENE: 2J	ND	DIESEL RANGE ORGANICS: 0.069J MOTOR OIL RANGE ORGANICS: 0.19J	NA
MBG-3	108-SBG-007	02/11/98	2-BUTANONE: R ACETONE: R	ND	ND	ND	NA
MBG-4	108-SBG-008	02/11/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ND	ND	MOTOR OIL RANGE ORGANICS: 0.40J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected

TABLE 4.16-1  
QUARTER 3  
ORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
MBG-1	108-SBG-009	05/14/98	2-BUTANONE: R ACETONE: R	PYRENE: 1J	ND	ND	NA
MBG-2	108-SBG-010	05/14/98	2-BUTANONE: R ACETONE: R	ACENAPHTHENE: 15 FLUORANTHENE: 4J PHENANTHRENE: 3J PYRENE: 5J	HEPTACHLOR EPOXIDE: 0.020J	ND	NA
MBG-3	108-SBG-011	05/14/98	2-BUTANONE: R ACETONE: R	ND	ND	ND	NA
MBG-4	108-SBG-012	05/14/98	2-BUTANONE: R ACETONE: R	ND	ND	GASOLINE RANGE ORGANICS: 0.028J	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected

TABLE 4.16-1  
QUARTER 4  
ORGANIC COMPOUNDS DETECTED IN BACKGROUND SAMPLES  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	VOLATILE ORGANIC COMPOUNDS (µg/L)	SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)	ORGANOCHLORINE PESTICIDES AND PCBs (µg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	OIL AND GREASE (mg/L)
MBG-1	108-SBG-013	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	PYRENE: 2J	ND	ND	NA
MBG-2	108-SBG-014	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ACENAPHTHENE: 19 ANTHRACENE: 1J FLUORANTHENE: 3J NAPHTHALENE: 1J PHENANTHRENE: 3J PYRENE: 5J	ND	DIESEL RANGE ORGANICS: 0.13J MOTOR OIL RANGE ORGANICS: 0.25J	NA
MBG-3	108-SBG-015	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ND	ND	ND	NA
MBG-4	108-SBG-016	08/10/98	2-BUTANONE: R 2-HEXANONE: R ACETONE: R	ND	ND	ND	NA

Notes:

µg/L = Micrograms per liter  
mg/L = Milligrams per liter  
NA = Not analyzed  
R = Rejected

PCBs = Polychlorinated biphenyls  
J = Value estimated at reported concentration  
ND = Not detected



TABLE 4.16-2  
QUARTER 1  
INORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			( $\mu\text{g/L}$ )																	
MBG-1	108-SBG-001	11/05/97	<0.65	14.7	508	<0.15	<0.44	<0.30	1.0J	<0.65	<3.2	1240	<0.10	<2.1	<1.9	<1.0	0.58J	<4.5	<0.40	<11.8
MBG-2	108-SBG-002	11/05/97	<0.65	2.4J	697	<0.15	<0.72	<1.3	0.80J	<0.65	<0.65	2140	<0.10	<0.30	<2.1	<1.0	<0.35	<0.90	<0.80	<11.2
MBG-2	108-SBG-100	11/06/97	NA																	
MBG-3	108-SBG-003	11/05/97	<0.66	14.2	67.5J	<0.15	<0.15	3.2J	<0.40	<0.65	<0.65	447	<0.10	<1.9	<2.7	<1.0	<0.35	<0.90	4.7J	<7.9
MBG-4	108-SBG-004	11/05/97	<0.86	<1.0	51.9J	<0.15	<0.37	<0.52	<0.40	4.3	<0.65	22.9	<0.10	<1.8	<3.9	<1.0	<0.35	<0.90	<1.1	<9.0

Notes:

$\mu\text{g/L}$  = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
NA = Not analyzed

TABLE 4.16-1  
QUARTER 2  
INORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS  
ALAMEDA POINT  
(Page 1 of 1)

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	SELENIUM	SILVER	THALLIUM	VANADIUM	ZINC
			(µg/L)																	
MBG-1	108-SBG-005	02/11/98	<0.84	10.5	416	<0.10	<0.20	<0.20	<1.5	<0.35	<0.60	1970	<0.10	<3.0	<1.6	<9.0	<0.15	<7.0	<0.30	<2.8
MBG-2	108-SBG-006	02/11/98	<0.70	1.4J	331	<0.10	<0.20	<0.92	<0.70	<0.35	<0.60	1060	<0.10	<0.25	<2.5	<9.0	<0.15	<1.4	<0.46	<3.0
MBG-3	108-SBG-007	02/11/98	<0.70	9.4	86.8J	<0.10	<0.20	2.8J	<0.26	<0.66	<0.60	417	<0.10	<1.2	<1.8	<1.8	<0.15	<1.4	<3.8	<2.2
MGB-4	108-SBG-008	02/11/98	<0.70	<0.80	56.1J	<0.10	<0.20	<0.39	<0.25	<4.3	<0.60	95.7	<0.10	<1.1	4.5J	<0.80	<0.15	<1.3	<0.62	<2.7

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

**TABLE 4.16-2**  
**QUARTER 3**  
**INORGANIC COMPOUNDS DETECTED IN BACKGROUND WELLS**  
**ALAMEDA POINT**  
**(Page 1 of 1)**

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
MBG-1	108-SBG-009	05/14/98	<1.7	11.3	735	<0.10	0.48J	1.8J	1.8J	2.1J	<0.50	1740	<0.10	<1.9	4.8J	R	<0.30	<1.4	<2.0	113
MBG-2	108-SBG-010	05/14/98	<0.85	<1.0	371	<0.10	<0.15	2.4J	<0.30	1.8J	<0.50	405	0.64	<0.50	3.2J	R	<0.30	<1.4	<2.4	103
MBG-3	108-SBG-011	05/14/98	<0.85	11.0	319	<0.10	<0.15	3.1J	<0.30	2.1J	<0.50	320	<0.10	<1.5	2.0J	R	<0.30	<1.4	<4.2	108
MBG-4	108-SBG-012	05/14/98	<0.85	<1.0	302	<0.10	<0.15	1.0J	<0.30	6.7J	<0.50	31.7	<0.10	<1.6	5.6J	R	<0.30	<1.4	<1.5	94.0

Notes:

µg/L = Micrograms per liter  
J = Value estimated at reported concentration

< = Parameter reported below reporting limit  
R = Rejected

**TABLE 4.16-2**  
**QUARTER 4**  
**INORGANIC COMPOUNDS DETECTED IN BACKGROUND SAMPLES**  
**ALAMEDA POINT**  
**(Page 1 of 1)**

WELL NO.	SAMPLE NUMBER	SAMPLE DATE	A N T I M O N Y	A R S E N I C	B A R I U M	B E R Y L L I U M	C A D M I U M	C H R O M I U M	C O B A L T	C O P P E R	L E A D	M A N G A N E S E	M E R C U R Y	M O L Y B D E N U M	N I C K E L	S E L E N I U M	S I L V E R	T H A L L I U M	V A N A D I U M	Z I N C
			(µg/L)																	
MBG-1	108-SBG-013	08/10/98	<1.8	<12.4	531	<0.20	<0.30	<0.80	3.1J	<1.9	<1.7	1470	0.14J	<1.0	<3.1	<2.2	<0.70	<5.5	<0.60	12.0J
MBG-2	108-SBG-014	08/10/98	<1.8	<3.2	189J	<0.20	<0.30	1.7J	<1.9	<1.7	12.1	502	<0.10	<1.0	<1.6	<2.2	<0.70	<1.1	<0.64	<5.4
MBG-3	108-SBG-015	08/10/98	<1.8	<10.6	67.3J	<0.20	<0.30	2.4J	3.0J	<1.5	<1.7	340	<0.10	<2.3	<1.6	<2.2	<0.70	<1.1	<4.1	<2.8
MBG-4	108-SBG-016	08/10/98	<1.8	<2.1	60.1J	<0.20	<0.30	<0.80	2.6J	<3.4	<1.7	70.6	<0.10	<1.1	<3.0	<2.2	<0.70	<1.1	<1.0	<1.4

Notes:

µg/L = Micrograms per liter

J = Value estimated at reported concentration

< = Parameter reported below reporting limit

TABLE 4.16-3  
BACKGROUND WELLS  
QUARTER 1  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
MBG-1	108-SBG-001	11/05/97	Alkalinity: 1700 Bicarbonate: 1700	Bromide: 27.3 Chloride: 4870 Phosphate: 1.8 Sulfate: 208	Total Dissolved Solids: 10000	ND	TOC Test 2: 19 Total Organic Carbon: 20
MBG-2	108-SBG-002	11/05/97	Alkalinity: 1340 Bicarbonate: 1340	Bromide: 16.7 Chloride: 3650 Phosphate: 0.98	Total Dissolved Solids: 6200	ND	TOC Test 2: 19 Total Organic Carbon: 20
MBG-3	108-SBG-003	11/05/97	Alkalinity: 519 Bicarbonate: 519	Bromide: 0.37 Chloride: 15.2 Fluoride: 1.7 Sulfate: 0.23	Total Dissolved Solids: 180	ND	TOC Test 2: 25 Total Organic Carbon: 26
MBG-4	108-SBG-004	11/05/97	Alkalinity: 183 Bicarbonate: 183	Bromide: 0.38 Chloride: 139 Fluoride: 0.43 Nitrate-N: 4.5 Sulfate: 34.9	Total Dissolved Solids: 240	ND	TOC Test 2: 6 Total Organic Carbon: 7

Notes:

mg/L = Milligrams per liter

ND = Not detected

TABLE 4.16-3  
BACKGROUND WELLS  
QUARTER 2  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
( Page 1 of 1 )

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)
MBG-1	108-SBG-005	2/11/98	Alkalinity: 1300 Bicarbonate: 1300	Bromide: 18.3 Chloride: 4490 Fluoride: 0.8 Phosphate: 0.33 Sulfate: 284	Total Dissolved Solids: 9000
MBG-2	108-SBG-006	2/11/98	Alkalinity: 943 Bicarbonate: 943	Bromide: 9.3 Chloride: 1980 Fluoride: 0.47 Phosphate: 1.8 Sulfate: 85.9	Total Dissolved Solids: 4100
MBG-3	108-SBG-007	2/11/98	Alkalinity: 532 Bicarbonate: 532	Bromide: 0.36 Chloride: 18.4 Fluoride: 1.3 Sulfate: 8.9	Total Dissolved Solids: 570
MBG-4	108-SBG-008	2/11/98	Alkalinity: 226 Bicarbonate: 226	Bromide: 0.21 Chloride: 72.2 Fluoride: 0.19 Nitrate: 1.1 Sulfate: 29	Total Dissolved Solids: 430

Notes:

mg/L

J

= Milligram per liter

= Value estimated at reported concentration

TABLE 4.16-3  
BACKGROUND WELLS  
QUARTER 3  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
MBG-1	108-SBG-009	05/14/98	Alkalinity: 1430 Bicarbonate: 1430	Bromide: 20.6 Chloride: 7090 Phosphate: 1.4 Sulfate: 196	Total Dissolved Solids: 12000	ND	NA
MBG-2	108-SBG-010	05/14/98	Alkalinity: 815 Bicarbonate: 815	Bromide: 4.7 Chloride: 1440 Nitrate-N: 1.1 Phosphate: 5.4 Sulfate: 44.2	Total Dissolved Solids: 3600	ND	NA
MBG-3	108-SBG-011	05/14/98	Alkalinity: 485 Bicarbonate: 485	Bromide: 0.34 Chloride: 14.8 Fluoride: 1.6 Phosphate: 0.14 Sulfate: 3.5	Total Dissolved Solids: 780	ND	NA
MBG-4	108-SBG-012	05/14/98	Alkalinity: 266 Bicarbonate: 266	Chloride: 38.6 Fluoride: 0.27 Nitrate-N: 4.5 Phosphate: 0.12 Sulfate: 29.9	Total Dissolved Solids: 490	ND	NA

Notes:

mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected

TABLE 4.16-3  
BACKGROUND WELLS  
QUARTER 4  
GENERAL CHEMICALS DETECTED IN GROUNDWATER  
ALAMEDA POINT  
(Page 1 of 1)

Well Number	Sample Number	Sample Date	Alkalinity (mg/L)	Anions (mg/L)	Total Dissolved Solids (mg/L)	Total Sulfide (mg/L)	Total Organic Carbon (mg/L)
MBG-1	108-SBG-013	08/10/98	Alkalinity: 1650 Bicarbonate: 1650	Bromide: 28.3 Chloride: 6260 Phosphate: 0.93 Sulfate: 184	Total Dissolved Solids: 13000	ND	NA
MBG-2	108-SBG-014	08/10/98	Alkalinity: 908 Bicarbonate: 908	Bromide: 4.7 J Chloride: 954 J Phosphate: 6.1 Sulfate: 4.0	Total Dissolved Solids: 2500	ND	NA
MBG-3	108-SBG-015	08/10/98	Alkalinity: 561 Bicarbonate: 561	Chloride: 18 J Fluoride: 1.8 J	Total Dissolved Solids: 750	ND	NA
MBG-4	108-SBG-016	08/10/98	Alkalinity: 232 Bicarbonate: 232	Bromide: 0.79 J Chloride: 185 J Sulfate: 22.4	Total Dissolved Solids: 620	ND	NA

Notes:

J = Value estimated at reported concentration  
mg/L = Milligrams per liter  
NA = Not analyzed  
ND = Not detected



## **5.0 WELL MAINTENANCE AND REPAIR**

Well maintenance and repair activities were conducted on all monitoring wells at Alameda Point from November 1997 through January 1998. The repair activities included major repair work, such as replacing damaged Christy boxes, and minor repair work such as replacing bolts, well plugs, and locks, and relabeling wells. These activities are summarized in Table 5.0-1.

**TABLE 5.0-1**  
**WELL REPAIR AND MAINTENANCE SUMMARY**  
**ALAMEDA POINT**  
(Sheet 1 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
D03-01	x				x	x			
D04-01	x				x	x			
D04-02	x			x	x	x			
D04-03	x				x	x			
D05-01	x				x	x			
D05-02					x	x			
D05-03	x				x	x			
D07A-01	x				x	x	x		
D07A-02	x				x	x			
D07A-03	x				x	x			
D07C-01	x		x		x	x			
D08-01	x				x	x			
D09-01					x	x			
D10A-01		x			x	x			
D10B-01				x	x	x	x		
D10B-02	x				x	x			
D11-01	x				x	x			
D12-01	x				x	x			
D13-01	x					x			
D14-01			x		x	x			
D19-01	x				x	x			
DRA-01					x	x			
M-IMF-01	x	x	x	x	x	x			
M-IMF-02									x
M001-A			x		x	x			
M001-B	x		x		x	x			
M001-E			x		x	x			
M002-A			x	x	x	x			
M002-E			x	x	x	x			
M003-A			x		x	x			
M003-B			x		x	x			
M003-E			x		x	x			
M004-A			x		x	x			
M005-A	x		x		x	x			
M006-A	x		x		x	x			
M007-A			x		x	x			
M007-C			x	x	x	x			
M008-A			x	x	x	x			
M009-A	x		x		x	x			
M01-P					x	x			
M010-A			x	x	x	x			
M010-B			x		x	x			
M011-A	x		x		x	x			
M012-A	x		x	x	x	x			

**TABLE 5.0-1**  
**WELL REPAIR AND MAINTENANCE SUMMARY**  
**ALAMEDA POINT**  
(Sheet 2 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
M012-B	x		x	x	x	x			
M013-A			x		x	x			
M013-C	x		x		x	x			
M014-A	x		x	x	x	x			
M014-B	x		x	x	x	x			
M015-A	x				x	x			
M016-A	x				x	x	x		
M016-B					x	x			
M016-E				x	x	x	x		
M017-A				x	x	x	x		
M018-A				x	x	x	x		
M018-E	x			x	x	x	x		
M019-A				x	x	x	x		
M019-E				x	x	x	x		
M02-P					x	x			
M020-A				x	x	x	x		
M020-B	x			x	x	x	x		
M020-E	x				x	x	x		
M021-A					x	x			
M021-C	x				x	x			
M021-E				x	x	x	x		
M022-A					x	x	x		
M022-E					x	x	x		
M023-A					x	x			
M023-B	x			x	x	x	x		
M023-C	x				x	x	x		
M023-E					x	x	x		
M024-A				x	x	x			
M024-E				x	x	x			
M025-A				x	x	x			
M025-C	x			x	x				
M025-E	x				x	x			
M026-A			x	x	x	x	x		
M026-E	x		x	x	x	x	x		
M027-A			x		x	x			
M027-B	x		x		x	x			
M027-C	x		x		x	x			
M027-E			x	x	x	x			
M028-A			x		x	x	x		
M028-C			x		x	x			
M028-E			x	x	x	x	x		
M029-A			x		x	x			
M029-E	x		x		x	x			
M03-04	x				x	x			

**TABLE 5.0-1**  
**WELL REPAIR AND MAINTENANCE SUMMARY**  
**ALAMEDA POINT**  
(Sheet 3 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
M03-05	x			x	x	x			
M03-06					x	x			
M03-07	x				x	x			
M03-08A	x			x	x	x			
M030-A			x		x	x			
M030-C			x		x	x			
M030-E			x		x	x			
M031-A			x	x	x	x			
M031-C			x		x	x			
M031-E			x		x	x			
M032-A			x		x	x			
M033-A			x		x	x			
M034-A			x	x	x	x			
M035-A			x		x	x			
M036-A			x		x	x			
M036-B			x		x	x			
M036-E			x		x	x			
M037-A			x		x	x			
M037-B			x		x	x			
M037-E			x		x	x			
M038-A			x		x	x			
M038-B			x		x	x			
M038-E			x		x	x			
M039-A			x		x	x			
M039-B			x		x	x			
M039-E			x		x	x			
M04-05	x			x	x	x			
M04-06	x				x	x			
M04-07	x			x	x	x			
M05-01	x			x		x			
M05-02				x	x	x			
M05-03				x	x	x			
M05-04				x	x	x			
M05-05	x			x	x	x			
M05-06	x				x	x			
M05-07	x				x	x			
M05-08				x	x	x			
M05-09	x	x			x	x			
M05-10					x	x			
M05-11					x	x			
M05-12					x	x			
M05-P					x	x			
M05BS-01					x	x			
M05HW-01	x				x	x			

**TABLE 5.0-1**  
**WELL REPAIR AND MAINTENANCE SUMMARY**  
**ALAMEDA POINT**  
(Sheet 4 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
M06-01					x	x			
M06-02		x		x	x	x			
M06-03					x	x			
M06-04					x	x			
M06-05					x	x			
M06-06		x		x	x	x			
M07A-01					x	x			
M07A-02	x			x	x	x			
M07A-03	x			x	x	x			
M07A-04	x			x	x	x			
M07A-05	x			x	x	x	x		
M07A-06	x			x	x	x	x		
M07A-07	x				x	x			
M07A-08	x				x	x			
M07A-09	x				x	x			
M07B-01	x				x	x			
M07C-06	x				x	x			
M07C-07	x			x	x	x			
M07C-08	x			x	x	x			
M07C-09				x	x	x			
M08-01					x	x			
M08-02					x	x			
M08-03				x	x	x			
M08-04				x	x	x			
M08-05				x	x	x			
M08-06				x	x	x			
M08-07					x	x			
M09-05	x				x	x			
M09-06				x	x	x	x		
M10-01	x			x	x	x			
M10-02				x	x	x			
M10-03					x	x			
M101-A			x	x	x	x			
M101-C		x	x		x	x			
M102-A			x		x	x			
M103-A	x		x	x	x	x			
M103-B	x		x	x	x	x			
M104-A									x
M104-C									x
M105-A	x		x	x	x	x			
M105-B	x		x	x	x	x			
M106-A	x		x		x	x			
M107-A	x		x		x	x			
M108-A	x				x	x			

TABLE 5.0-1  
WELL REPAIR AND MAINTENANCE SUMMARY  
ALAMEDA POINT  
(Sheet 5 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
M108-B	x				x	x			
M109-A	x				x	x			
M10B-01	x			x	x	x			
M11-01	x			x	x	x			
M11-02	x			x	x	x			
M11-03	x			x	x	x			
M11-04	x			x	x	x	x		
M11-05	x				x	x			
M11-06					x	x			
M110-A					x	x			
M111-A					x	x			
M112-A			x		x	x			
M113-A			x		x	x			
M114-A									x
M115-E					x	x			
M116-E					x	x			
M117-E					x	x			
M12-01	x			x	x	x			
M12-02	x			x	x	x			
M12-03				x	x	x			
M12-04					x	x			
M13-06				x	x	x			
M13-07	x			x	x	x			
M13-08				x	x	x			
M13-09	x				x	x			
M13-P	x				x	x			
M14-01			x		x	x			
M14-02			x	x	x	x			
M14-03			x		x	x			
M15-01					x	x			
M15-02									x
M15-03					x	x			
M16-04	x				x	x			
M19-05	x				x	x			
M2A					x	x			
MBG-1					x	x			
MBG-2					x	x			
MBG-3					x	x			
MBG-4	x	x			x	x			
MW-1	x				x	x			
MW360-1	x			x	x	x			
MW360-2	x				x	x			
MW360-3	x			x		x			
MW360-4	x			x	x	x			

**TABLE 5.0-1**  
**WELL REPAIR AND MAINTENANCE SUMMARY**  
**ALAMEDA POINT**  
(Sheet 6 of 6)

Well Number	Marked well name on outside of well	Added water-level measuring point	Installed T-stake marker	Replaced allen screws or bolts	Replaced cap	Replaced lock	Replaced christy box	Well not access- ible	Well not found
MW410-1				x	x	x			
MW410-2				x	x	x			
MW410-3				x	x	x			
MW410-4					x	x			
MW530-1	x			x		x			
MW530-2	x			x	x	x			
MW530-3	x			x	x	x			
MW547-1				x		x			
MW547-2								x	
MW547-3				x	x	x			
MW547-4				x	x	x			
MW547-5									x
MW97-1	x			x		x			
MW97-2	x			x		x			
MW97-3				x	x	x			
MWC2-1	x				x	x			
MWC2-2	x					x			
MWC2-3	x					x			
MWD13-1				x	x	x			
MWD13-2	x			x	x	x			
MWD13-3	x			x	x	x			
MWD13-4	x				x	x			
MWOR-1	x			x	x	x	x		
MWOR-2	x			x		x			
MWOR-3	x			x		x			
MWOR-4	x				x	x			
MWOR-5				x		x			
PEZ-17-01					x	x			
PEZ-17-02					x	x			
PEZ-17-03					x	x			
PEZ-17-04					x	x			
W-1	x				x	x			
W-2	x				x	x			
W-3									x
WA-8						x			

## 6.0 SUMMARY AND CONCLUSIONS

During quarterly groundwater sampling, organic compounds were consistently detected at concentrations exceeding the MCLs in the vicinity of the previously identified solvent plumes in groundwater. Less than half of the wells sampled exhibited concentrations of organics exceeding the MCLs. Concentrations were low to nondetect in groundwater from wells at the edges of each plume. In groundwater samples from most wells located away from the solvent plumes, no organics were detected. Some seasonal variability was evident in the detected concentrations of VOCs. In general, detected concentrations of solvents in groundwater from Quarter 2 were less than the Quarter 1 concentrations, possibly due to the dilution effects of the infiltration of rainwater during the February (Quarter 2) sampling round. Results from Quarters 3 and 4 were comparable to Quarter 1 results.

In five of the six areas of petroleum hydrocarbon contamination where TPPH and TEPH analyses were conducted (Sites 1, 3, 7, 13 and 19, and 14), diesel, motor oil, and/or gasoline were detected in all but a few of the samples. Site 22 was the exception; hydrocarbons were detected in only one of the four Site 22 wells in which TPPH and TEPH analyses were conducted during Quarters 1 and 2, and in one of two Site 22 wells during Quarters 3 and 4.

Detected SVOCs were generally associated with monitoring wells where several VOCs or petroleum hydrocarbons were detected. SVOCs were consistently detected in two of the background wells. Analyses for organochlorine pesticides and PCBs were performed on samples from four monitoring wells at Site 2 and the four background wells, but no analytes were detected in Quarters 1, 2, or 4, and only heptachlor epoxide was detected in one Site 2 sample and one background well sample at very low concentrations during Quarter 3.

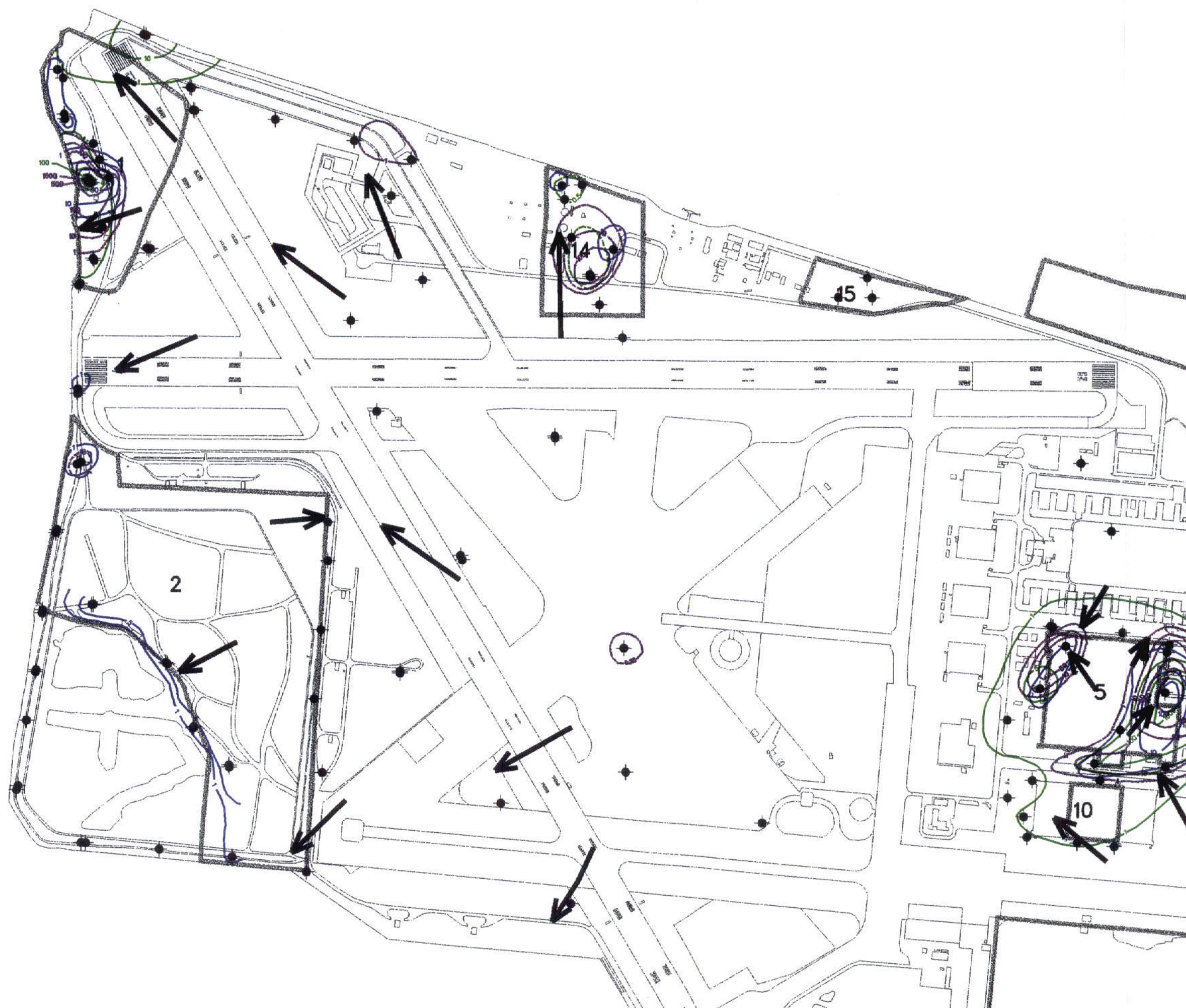
Metals were detected in groundwater at concentrations exceeding the MCLs in most samples collected as part of this groundwater monitoring program including groundwater samples from all four background wells. Metals exceeded the MCLs in all but 19 Quarter 1 samples, all but 10 Quarter 2 samples, all but 3 Quarter 3 samples, and all but 7 Quarter 4 samples.

Figures 6-1 through 6-6 present groundwater organic contaminant plumes for each region of the installation based on groundwater samples collected during the 1994/1995 and 1997/1998 sampling events. A few contaminant plumes shown on the 1994/1995 plots (the eastern portion of Site 3, Site 8, a portion of Site 9, Site 13, Site 14, Site 16, and Site 23) are not presented on the 1997/1998 plots due to



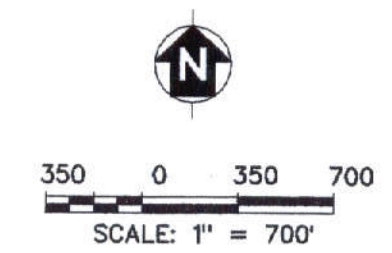
insufficient data. The contaminant plumes were prepared using the average concentration for each of three representative compounds: benzene, trichloroethene, and vinyl chloride. A complete list of organic compounds present in each plume is described by site in Section 4. Time-series plots for each well within a contaminant plume are also presented at the end of each site-specific presentation in Section 4.

In general, the contaminant plumes in the western region decreased slightly in aerial extent between the 1994/1995 and 1997/1998 sampling events. However, the concentration of individual degradation products in the plume at Site 1 increased substantially. In the central region, the aerial extent of the plumes at Site 5 decreased dramatically and the concentration of individual chemicals at Site 5 decreased by one to three orders of magnitude between the 1994/1995 and 1997/1998 sampling events. In the southeastern region, the aerial extent of the plumes did not change substantially; however, the concentration of individual chemicals at Site 4 decreased by one to two orders of magnitude between the 1994/1995 and 1997/1998 sampling events.



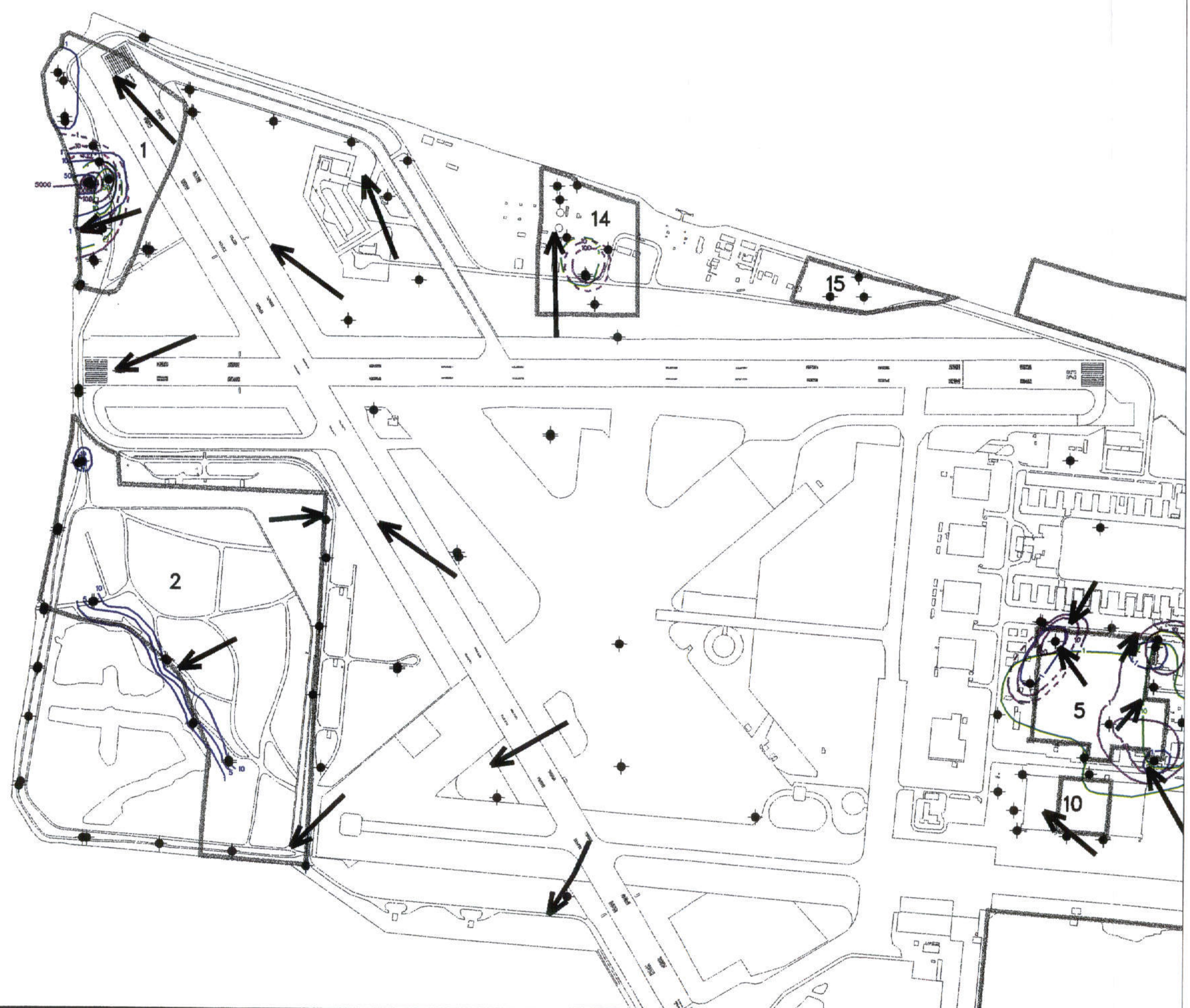
- LEGEND**
- MONITORING WELL
  - FIRST WATER BEARING ZONE
  - BENZENE PLUME 1994-1995
  - TCE PLUME 1994-1995
  - VINYL CHLORIDE PLUME 1994-1995
  - 8 INSTALLATION RESTORATION SITE
  - GROUNDWATER FLOW DIRECTION

NOTE: PLUME CONCENTRATIONS ARE IN MICROGRAMS PER LITER



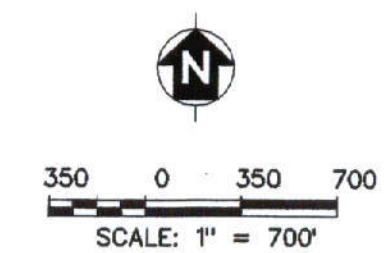
**FIGURE 6-1**  
**GROUNDWATER CONTAMINANT**  
**PLUMES (1994-1995)**  
**WESTERN REGION**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**





- LEGEND**
- MONITORING WELL
  - FIRST WATER BEARING ZONE
  - BENZENE PLUME 1997-1998
  - TCE PLUME 1997-1998
  - VINYL CHLORIDE PLUME 1997-1998
  - 8 INSTALLATION RESTORATION SITE
  - GROUNDWATER FLOW DIRECTION (AUGUST 1998)

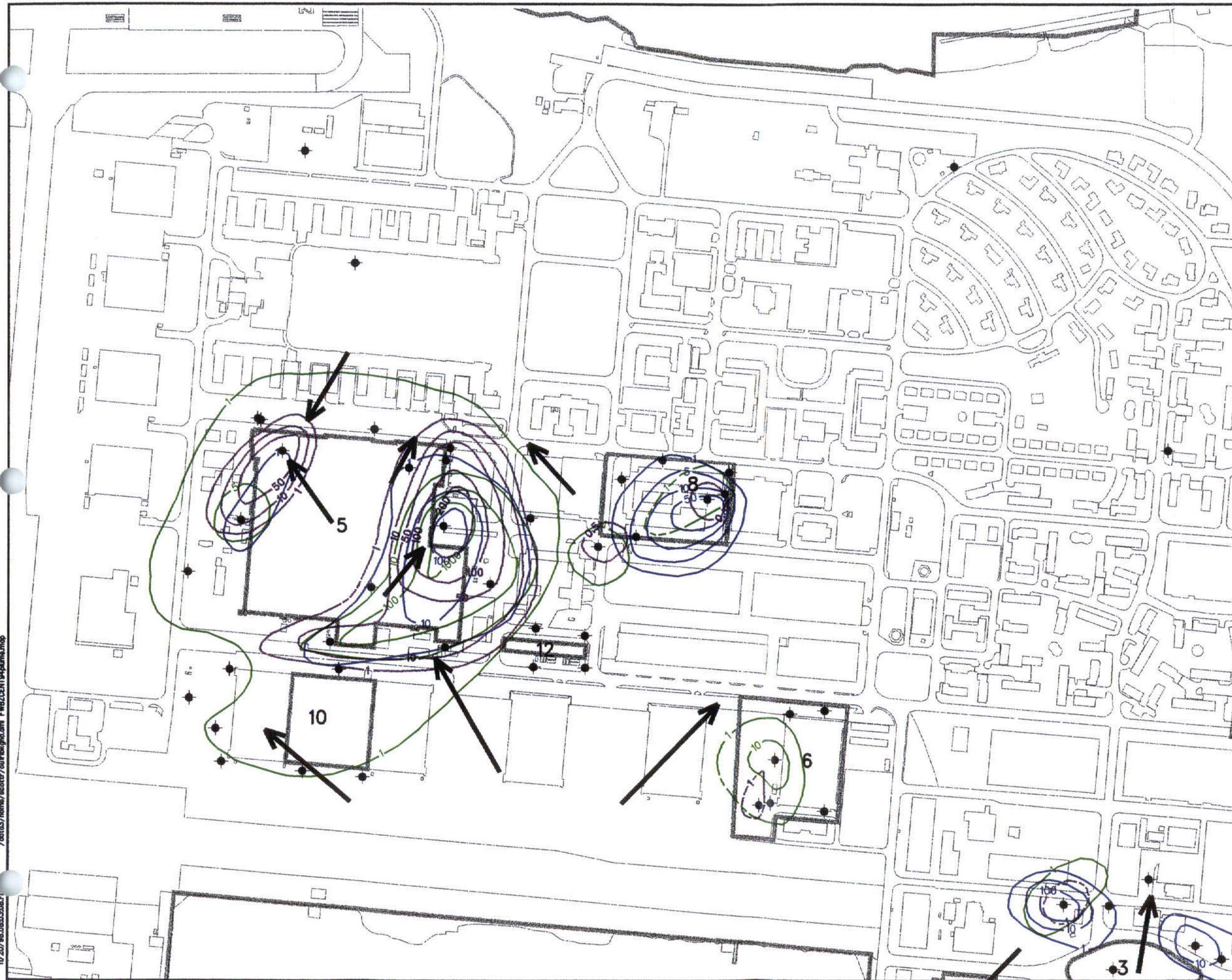
NOTES: 1. PLUME CONCENTRATIONS ARE IN MICROGRAMS PER LITER  
2. NOT ALL PLUMES ARE SHOWN DUE TO A LIMITED NUMBER OF WELLS SAMPLED



**FIGURE 6-2**  
**GROUNDWATER CONTAMINANT**  
**PLUMES (1997-1998)**  
**WESTERN REGION**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**



11/20/98 08:53:08 F:\data3\home\ecotr\out\risk\gnd\al FWGZCENT94-95a.mxd



# **LEGEND**

- MONITORING WELL
- FIRST WATER BEARING ZONE
- BENZENE PLUME 1994-1995
- TCE PLUME 1994-1995
- VINYL CHLORIDE PLUME 1994-1995
- 8 INSTALLATION RESTORATION SITE
- GROUNDWATER FLOW DIRECTION

NOTE: PLUME CONCENTRATIONS ARE IN MICROGRAMS PER LITER

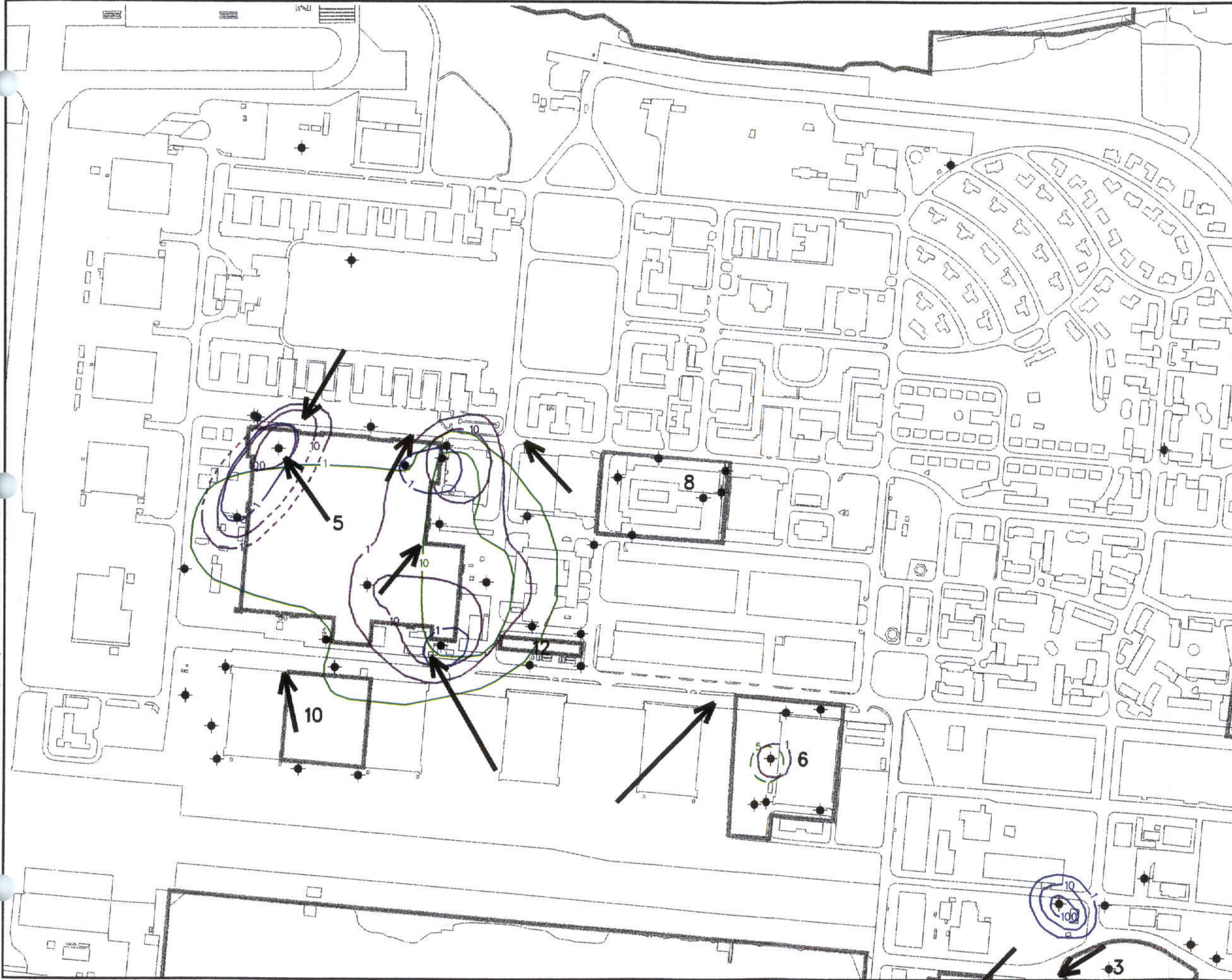


200 0 200 400  
SCALE: 1" = 400'

**FIGURE 6-3**  
**GROUNDWATER CONTAMINANT**  
**PLUMES (1994-1995)**  
**CENTRAL REGION**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

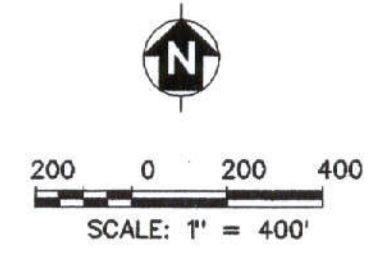


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- LEGEND**
- MONITORING WELL
  - FIRST WATER BEARING ZONE
  - BENZENE PLUME 1997-1998
  - TCE PLUME 1997-1998
  - VINYL CHLORIDE PLUME 1997-1998
  - 8 INSTALLATION RESTORATION SITE
  - GROUNDWATER FLOW DIRECTION (AUGUST 1998)

NOTES: 1. PLUME CONCENTRATIONS ARE IN MICROGRAMS PER LITER  
2. NOT ALL PLUMES ARE SHOWN DUE TO A LIMITED NUMBER OF WELLS SAMPLED



**FIGURE 6-4**  
**GROUNDWATER CONTAMINANT**  
**PLUMES (1997-1998)**  
**CENTRAL REGION**  
**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**











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